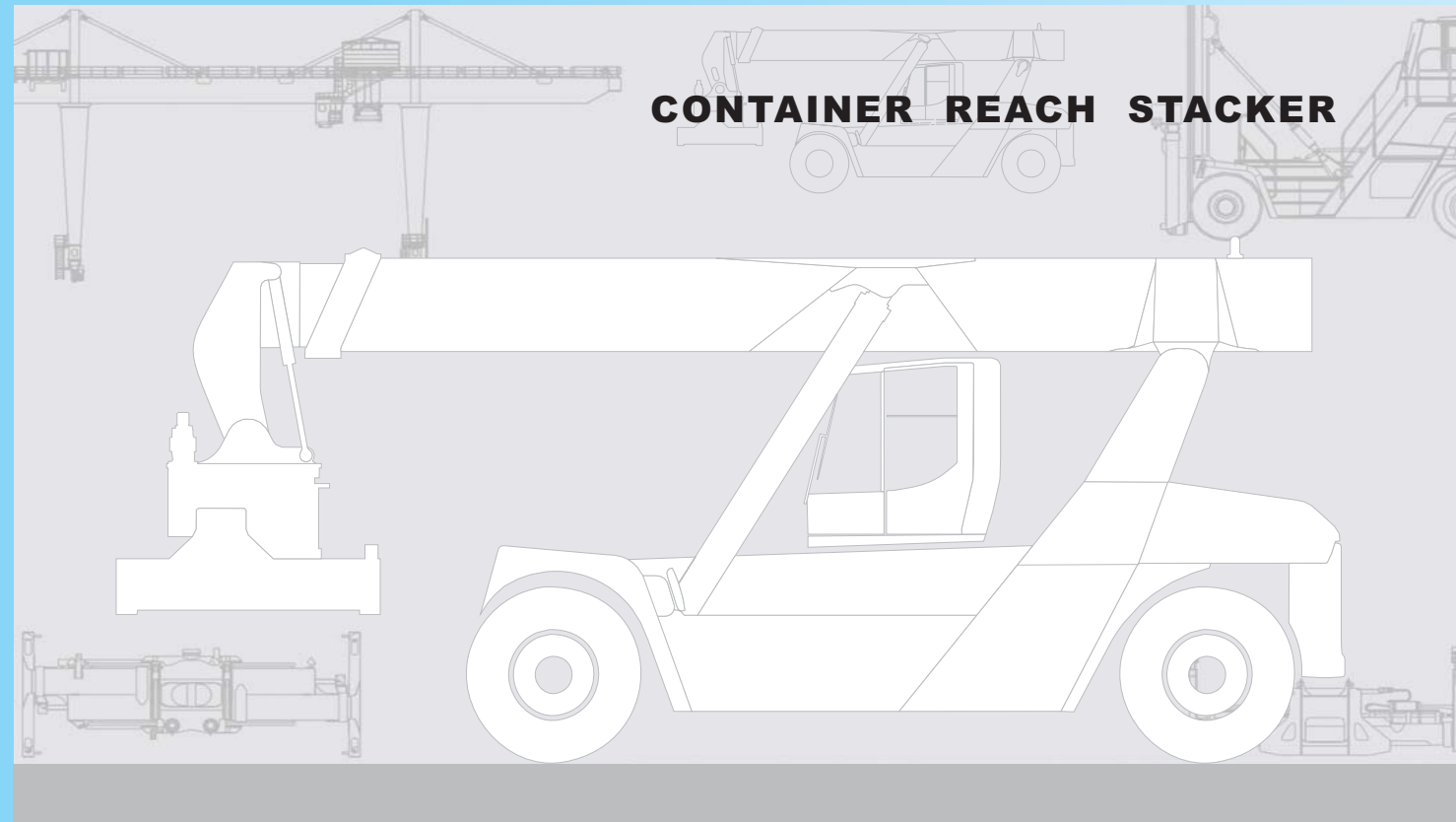




# MAINTENANCE MANUAL

集装箱正面吊运机维护手册

## CONTAINER REACH STACKER



### CONTENTS

1. Preparing Work before Maintenance
2. Maintenance Cycle Table of the Whole Machine
3. Maintenance of the Equipment
4. Lubricating
5. Functional Oil
6. Checking of Key Bolts
7. Safty Regulations during Maintenance Work
8. Common Faults and Measures
9. Maintenance of Equipment Tracking Sheet

SANY

Preface

This manual mainly introduced specific maintenance method of container reach stacker (here after refer to reach stacker) and other malfunction elimination methods. Concerning certain type of reach stacker, there will be more detailed information.

We sincerely appreciate your purchase of our product SANY Container reach stacker. We will provide you with high-quality products and high-class after-sales service.

Our Company has derived the technology quintessence of the production of the container reach stacker mobile in and out of China. With the rich experience of designing and manufacturing of engineering machinery, we develop the reach stacker, which is completely new container handling equipment. It is widely used at the container terminal, railway transfer station, highway terminate station and container freight yard, and mainly used for the stacking and portage of containers.

The manual shows in details the specifications of performance parameter, technical characters, operational principle, structural composition, safe operation, transportation, lubrication and maintenance of SANY Container reach stacker.

In order to ensure a better operation of the reach stacker, we strongly recommend you to read this manual carefully before operation. It will:

- ☐Help you understand the reach stacker;
- ☐Protect you from danger owning to improper operation;
- ☐Enhance the reliability of the reach stacker;
- ☐Enhance the service life of the reach stacker;
- ☐Reduce the repair cost and the shutdown time.

Please put this manual at an easily reachable position for your reference at any time. Only after fully understanding this manual, can you operate the reach stacker skillfully and safely.

Thanks for your trust to the SANY products. We sincerely wish you realizing your ambitious dreams in the future works and making great achievement.

SANY Group



Reading Guidance

1.Information

The maintenance manual is a manual for you to use and maintain the machine. It should be always put in the cab for your reference at any time. If it is damaged or lost, you should order another one from Hunan SANY Group. The Manual covers the information and instructions for safety, technology, operation, transportation, lubrication and maintenance. Furthermore, some photos, drawing details or optional components shown in the Manual may differ from your machine. To make the instructions easy, the cover sheet and hood may have been dismantled.

The Manual may exclude the modification due to the improvement and updating of products. It is recommended for you to read and research the Manual carefully and put it together with your machine.

For any question on the machine or the Manual, please contact us for the latest information.

2.Preparing Work before Maintenance

Preparing work steps are introduced in the Preparing Work before Maintenance part.

3.Maintenance Cycle of the Whole Machine

Maintenance cycle of key parts of the machine are showed in this part which provide references to maintain the machine in a regular time.

4.Maintenance of the Equipment

Maintenance detailed specification of key parts such as engine, transmission, driving axle and spreader etc. is showed in this part which indicate the direction of maintenance work of the equipment.

5.Lubricating

Necessary lubricating materials to enable normal

work of the equipment are listed. The whole equipment lubricating cycle table which includes lubricating points and lubricating cycle is listed. Clients must lubricate the equipment according to this cycle table.

6.Function Oils

Technical specification of hydraulic oil etc medium and their standards, oil tank and volume are introduced in this part. Brand and type of recommended oil by the manufacturer are also listed in this part.

7.Inspection of Key Bolts

Inspection requirements of each key fastening bolts and torque are listed in this part.

8.Safety during Maintenance Work

Safety matters needing attention while maintenance, checking and lubrication: safety measure in the working place, safety measure of product: introduction of personnel's safeguard measures.

9.Guidebook of Identifying Common Malfunction

Common mechanical/hydraulic/electric system malfunction are introduced in this part, which point out direction for diagnosing common malfunction of the equipment.

10.Track Record of Maintenance

Taking track record provide convenience to the maintaining staff to keep track of the status of maintenance and is easy to check the working condition of the equipment.

11.Explanation of Signs



The sign of “Danger” means the direct danger, which may cause death or serious injury if no preventive measure is taken.

Reading Guidance



 Warning

It means the potential danger, which may cause death or serious injury if no preventive measure is taken.

 Caution

It means the potential danger, which may cause slight or moderate injury if no preventive measure is taken.

Caution

There is no safety indication. If you ignore this indication, there will be some potential danger to induce loss of property.

Notice

It awarks people to take attention to the operation and maintenance.



TABLE OF CONTENTS

Container Reach Stacker Maintenance Manual



|                                                             |      |
|-------------------------------------------------------------|------|
| 1. Preparing Work before Maintenance                        | 1-1  |
| 2. Maintenance Cycle Table of the Whole Machine             | 2-1  |
| 3. Maintenance of the Equipment                             | 3-1  |
| 3.1 Repairing and Maintenance of the Engine                 | 3-1  |
| 3.2 Repairing and Maintenance of Transmission               | 3-5  |
| 3.3 Repairing and Maintenance of the Drive Axle             | 3-6  |
| 3.4 Repairing and Maintenance of the Steering Axle          | 3-7  |
| 3.5 Repairing and Maintenance of the Spreader               | 3-8  |
| 3.6 Repairing and Maintenance of the Jib System             | 3-10 |
| 3.7 Repairing and Maintenance of the Air Conditioner System | 3-11 |
| 3.8 Repairing and Maintenance of Tyres                      | 3-11 |
| 3.9 Repairing and Maintenance of Hydraulic System           | 3-13 |
| 3.10 Repairing and Maintenance of Electric System           | 3-14 |
| 4. Lubricating                                              | 4-1  |
| 4.1 Lubrication                                             | 4-1  |
| 4.2 Lubricating Table                                       | 4-1  |
| 5. Functional Oil                                           | 5-1  |
| 5.1 Oil Specification                                       | 5-1  |
| 5.2 Oil Capacity                                            | 5-2  |
| 5.3 Check and Change of Hydraulic Oil                       | 5-2  |
| 5.4 Using Principle of Oil                                  | 5-3  |
| 6. Checking of Key Bolts                                    | 6-1  |
| 7. Safty Regulations during Maintenance Work                | 7-1  |
| 8. Common Faults and Measures                               | 7-1  |
| 8.1 General                                                 | 7-1  |
| 8.2 Common Faults of Mechanical Systems and Measures        | 8-1  |
| 8.3 Common Faults of Hydraulic System and Measures          | 8-4  |
| 8.4 Common Faults of Electrical Control System and Measures | 8-6  |

TABLE OF CONTENTS

Container Reach Stacker Maintenance Manual



|                                            |     |
|--------------------------------------------|-----|
| 9. Maintenance of Equipment Tracking Sheet | 9-1 |
|--------------------------------------------|-----|

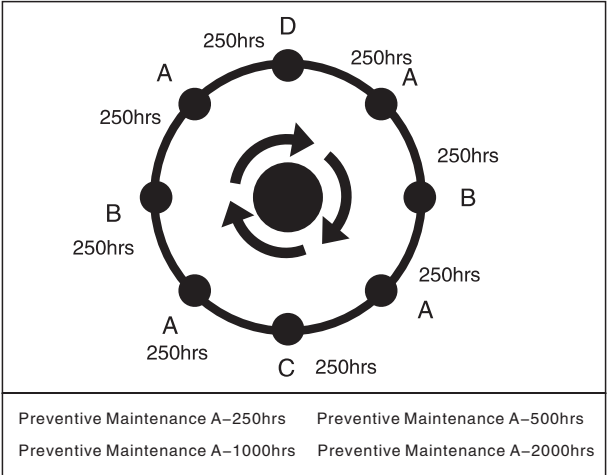
PREPARING WORK BEFORE MAINTENANCE

Container Reach Stacker Maintenance Manual



In order to avoid unnecessary break down of reach stacker, enhance the reliability and maneuverability, reduce repair cost, client should have a whole maintenance plan before operating. In the run-in period, reach stacker can only stand the medium or less load work. After working its first 50 to 100 h work, reach stacker must take a maneuverability maintenance. One should take the fist maintenance according to C maintenance including adjustment of engine valve clearance.

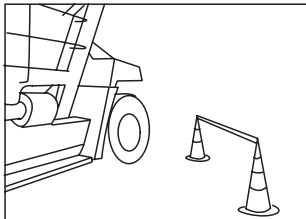
Specification: We have already done the maneuverability maintenance of the equipment for you.



1. Preparing Work before Maintenance

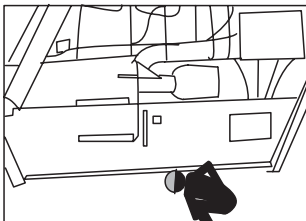
Before repairing and maintenance of the Container reach stacker, preparations should be well done strictly according to the following steps:

★Ensure engine will be stopped in the safe working site. If necessary, use the colored ribbon to separate the safety isolated belt.

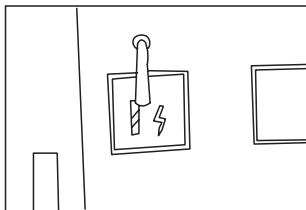


★Walk one circle around the engine, check if there exists damage and leakage.

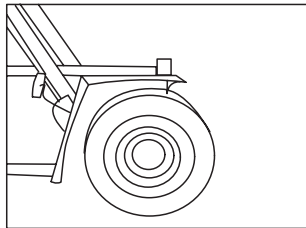
★The function test should be conducted to.



★Close the main switch, and take away the key.



★Set the limit stop in the front and back of the tyre, so as to prevent accidental movement of engine.



★Hang the warning brand of “stop, in repairing” on the engine.  
(One is hung on the steering wheel and one is hung at the end of engine)



MAINTENANCE CYCLE TABLE OF THE WHOLE MACHINE

Container Reach Stacker Maintenance Manual



2. Maintenance Cycle Table of the Whole Machine

Plan Of Maintenance

| Serial No. | Maintenance parts              | Maintenance items                                                  | Applicable plan |
|------------|--------------------------------|--------------------------------------------------------------------|-----------------|
| 1          | Engine                         | Check air cleaning status indicator                                | A B C D         |
| 2          |                                | Replace air filter core                                            | A B C D         |
| 3          |                                | Replace engine oil and engine oil filter core                      | A B C D         |
| 4          |                                | Replace diesel filter core                                         | A B C D         |
| 5          |                                | Check cooling water quality and amount                             | A B C D         |
| 6          |                                | Clean foreign matters on the surface of the radiator               | A B C D         |
| 7          |                                | Check belt and belt wheel                                          | A B C D         |
| 8          |                                | Check start, stop, and operation of engine                         | A B C D         |
| 9          |                                | Check if oil, diesel, and water leakage exists                     | A B C D         |
| 10         |                                | Check if turbocharger and exhaust gas tube have leakage            | A B C D         |
| 11         |                                | Replace oil-water separator filter core                            | B C D           |
| 12         |                                | Clean oil stain in the oil cleaner                                 | B C D           |
| 13         |                                | Replace cooling water filter core                                  | C D             |
| 14         |                                | Check if damping pad and fixed bolt are loose and                  | D               |
| 15         |                                | brokenCheck and adjust clearance of intake valve and exhaust valve | 50 D            |
| 16         | Gearbox and transmission shaft | Check and add transmission oil                                     | A B C D         |
| 17         |                                | Check if fixed bolt of the transmission shaft is loose and Broken  | A B C D         |
| 18         |                                | Check rotary speed inductor                                        | A B C D         |
| 19         |                                | Replace transmission filter core                                   | C D             |
| 20         | Drive axle and brake system    | Replace transmission oil                                           | C D             |
| 21         |                                | Check if fixed bolt and fixed seat are loose and broken            | D               |
| 22         |                                | Check fixed bolt of drive axle tightness degree                    | A B C D         |
| 23         |                                | Check if bolts of pressure plate of tyre are loose or broken       | A B C D         |
| 24         |                                | Check if drive axle and brake components have oil Leakage          | A B C D         |
| 25         |                                | Check and add oil of drive axle differential and planet            | A B C D         |
| 26         |                                | Replace oil of drive axle differential and planet gear case        | C D             |
| 27         |                                | Clean venthole adaptor                                             | C D             |
| 28         |                                | Check hand brake sheet and hand brake function                     | A B C D         |

MAINTENANCE CYCLE TABLE OF THE WHOLE MACHINE

Container Reach Stacker Maintenance Manual



| Serial No. | Maintenance parts            | Maintenance items                                                                      | Applicable plan |
|------------|------------------------------|----------------------------------------------------------------------------------------|-----------------|
| 29         | Steering axle                | Check if steering axial component has abnormal clearance and damage                    | A B C D         |
| 30         |                              | Check anti-tilting inductor                                                            | A B C D         |
| 31         |                              | Check if bolts of tyre pressure plate are loose and broken                             | A B C D         |
| 32         |                              | Check if tyre is deflective                                                            | A B C D         |
| 33         |                              | Check if steering wheel bearing and fixed nut are loose or broken                      | C D             |
| 34         |                              | Check if spherical pin and fixed nut are loose and broken                              | C D             |
| 35         | Crane spreader               | Check twist-lock and relevant components                                               | A B C D         |
| 36         |                              | Check twist-lock inductor and indicator                                                | A B C D         |
| 37         |                              | Check and adjust 20 /40 chain and limit                                                | A B C D         |
| 38         |                              | Check crane spreader rotary decelerator gear oil and lubricating oil amount            | B C D           |
| 39         |                              | Replace crane spreader rotary decelerator gear oil                                     | C D             |
| 40         |                              | Check if fixed bolt of crane spreader rotary gear case is loose and broken             | C D             |
| 41         |                              | Check if slide block on the crane spreader is abraded to the limit                     | C D             |
| 42         |                              | Check if crane spreader has cracks by general vision                                   | C D             |
| 43         | Contraction and pitch system | Check if fixed seat and lock pin on the basic boom are loose, broken, and worn         | A B C D         |
| 44         |                              | Check if fixed seat and lock pin on the pitch oil cylinder are loose, broken, and worn | A B C D         |
| 45         |                              | Check if slide block on basic boom is abraded to the limit                             | B C D           |
| 46         |                              | Check if basic boom has cracks by general vision                                       | D               |
| 47         | Hydraulic system             | Check oil amount in main hydraulic oil tank and brake oil tank                         | A B C D         |
| 48         |                              | Check accumulator pressure                                                             | A B C D         |
| 49         |                              | Check if hydraulic pressure on the hydraulic nameplate is consistent                   | C D             |
| 50         |                              | Replace all high-pressure filter cores                                                 | C D             |
| 51         |                              | Replace brake oil and brake cooling oil filter core                                    | C D             |
| 52         |                              | Replace hydraulic oil and hydraulic system filter core                                 | C D             |

MAINTENANCE CYCLE TABLE OF THE WHOLE MACHINE

Container Reach Stacker Maintenance Manual



| Serial No. | Maintenance parts | Maintenance items                                                          | Applicable plan |
|------------|-------------------|----------------------------------------------------------------------------|-----------------|
| 53         |                   | Replace main hydraulic oil tank and brake oil tank ventilation filter core | D               |
| 54         | Circuit           | Check if battery water is sufficient                                       | A B C D         |
| 55         |                   | Check all working lights and indicator lights                              | A B C D         |
| 56         | General items     | Check tyre pressure plate and nut tightness degree                         | A B C D         |
| 57         |                   | Check tyre status and air pressure                                         | A B C D         |
| 58         |                   | Check horn, reversing buzzer, and alarm light                              | A B C D         |
| 59         |                   | Lubricate all slide blocks and lubrication points                          | A B C D         |
| 60         | Function test     | Test anti-tilting protective system                                        | A B C D         |
| 61         |                   | Test twist-lock safety interlocking device system                          | A B C D         |
| 62         |                   | Test integrated function of hydraulic system                               | A B C D         |
| 63         |                   | Check and treat places with oil or water leakage                           | A B C D         |

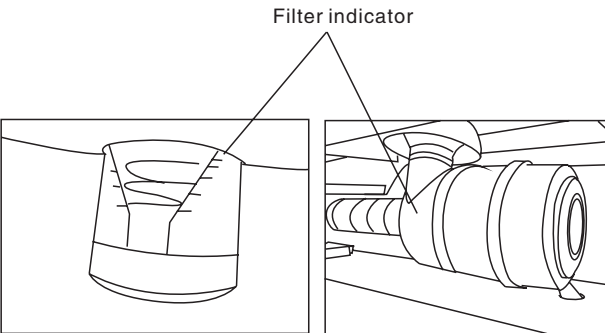


3.Maintenance of the Equipment

3.1 Repairing and Maintenance of the Engine

★Check the air filter indicator

In order to find out the cleanliness of the filter core check of the filter indicator is necessary. When the indicator turns red, filter core must be changed.



★Change the air filter core

Change the air filter core because:

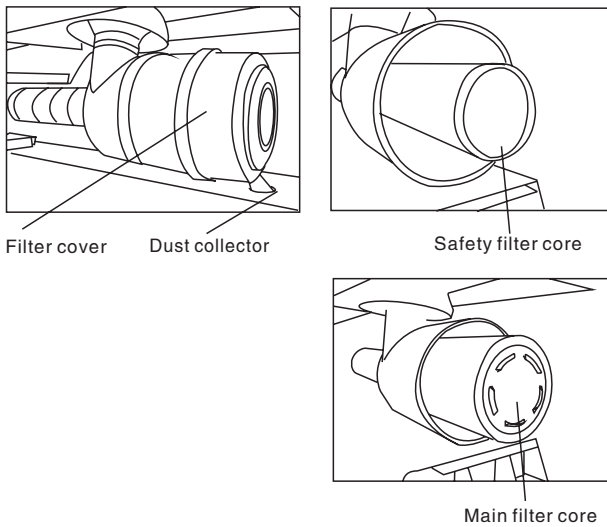
- Squalid air filter core may decrease the air that the combustion chamber needs as it is normally burning, which leads to incomplete burn.
- The engine needs enough air to support the combustion if it achieves the largest power.
- If the filter performance of the core becomes worse, the outer particulate may come into the combustion chamber to cause the abnormal abrasion in the cylinder.

If the working environment becomes quite worse, regular inspection of air filter cleaner must be taken regularly. As the indicator turns red, the filter core must be changed.

Notice

Before changing the filter core, the inside of filter core shell must be wiped. If in the emergency cases, the main filter core must be cleaned out, and reinstalled. The main filter core is unsuitable to be washed by compressed air.

Change the safety filter core as the cases below:



★Change the engine oil and engine oil filter oil

Function of the engine oil:

- Cleaning: Wash away the wear scraps and carbon in the system.
- Cool down: Take away the heat generated by the engine and its components.

The performance and decontamination ability of the engine oil may goes bad as the reason of temperature and carbon, the reason is that the viscosity of the water、diesel and engine oil has been decreased. Besides, as the contamination of the carbon, the acidity of the engine oil will be increased, which may generate chemical reaction with metals, so that the metal goes rusty. Because of the reasons above, the engine oil should be changed after the usage of a period to ensure the system normal.

We have to check the status of engine oil regularly. Once abnormal situation is found, prompt treatment should be taken.

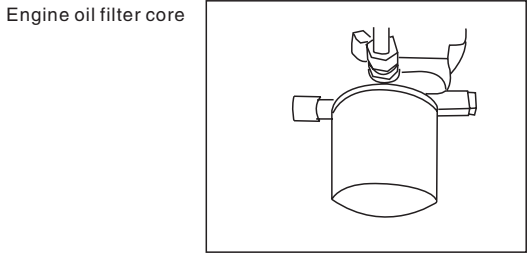
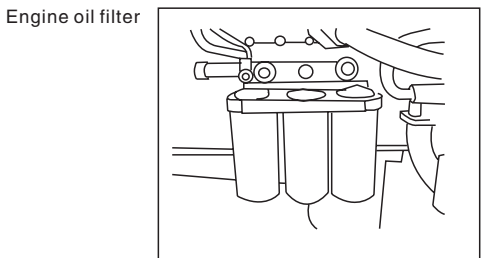
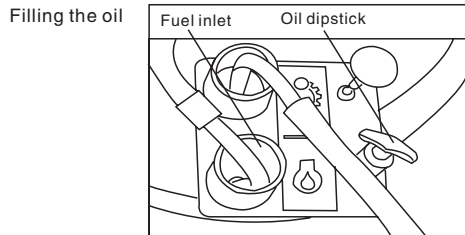
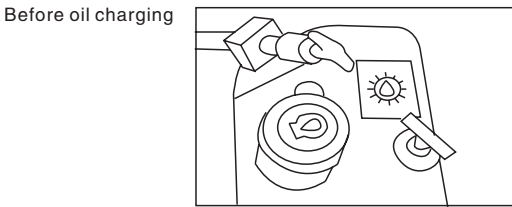
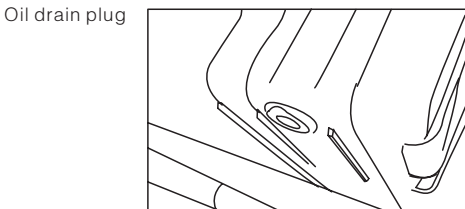
| No. | Phenomenon                        | Cause                                                                                                             |
|-----|-----------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 1   | Engine oil level arising          | The lube system is infiltrated with water or coolant                                                              |
| 2   | Engine oil with metal pellet      | Surface of the spool with is large area damaged                                                                   |
| 3   | Quick reduction of the engine oil | Piston ring damaged, the engine oil come into the combustion chamber, engine oil leakage from the edge and joints |



Take care of the filling-up amount of the engine oil as charging. If the level is too high, the foam may come out, lube ability may be decreased. Otherwise, if too low of the oil level and there may be not enough engine oil into the lube system. The filter core of the engine oil plays a part of filtering the engine oil. When the filter has been blocked, the engine oil may be blocked into the system, the cooling and lube ability of the engine oil may be decreased. So that engine oil filter core must be changed.

As changing the filter core, something. Should be taken out as follows:

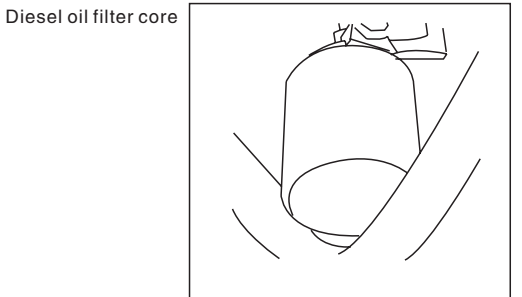
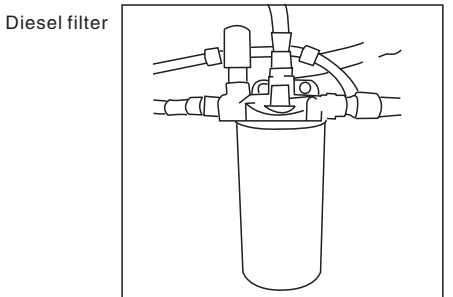
Fresh engine oil and new filter should be used, the seal rings of the filter should be infiltrated by the fresh engine oil; tighten it by hand and then screw it three-fourths coil.



★Change the diesel filter core

The diesel may be blocked into the injection system by jammed and unclean filter, which make the diesel deficient atomization, lowering the working efficiency of engine.

Attention while changing the diesel filter core: The seal rings of the filter should be infiltrated by the fresh fuel oil; tighten it by hand till touching and then screw it half coil.



★Change the oil-and-water trap filter core

The main function of oil-and-water trap is to separate the impurity and water from the oil, and so that it can provide clean fuel to the engine. Firstly detach the core from the top, then loose the bottom valve, clean the inner of the oil cup, replace another new one (take care to change all the seal O-rings), at last charging the fresh fuel oil.

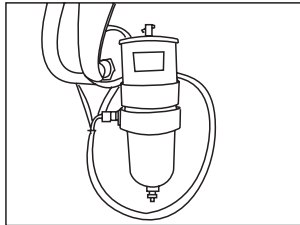
## MAINTENANCE OF THE EQUIPMENT

Container Reach Stacker Maintenance Manual



### Notice

As changing the filter core, it is necessary to clean the bottom oil cup, so that it is obvious to know whether the oil cup is clean.



### ★Inspect the quality and quantity of the cooling water

Observe the cooling water on one's own eyes. It is necessary that the cooling water should be changed when it become worse. When the cooling water is not enough, you should recharge for fear of overheat of the engine.

Shell anti-freeze (ice point:-45℃) 50L

### ★Clean the contamination attached on the surface of the radiator

In order to the cool the air thoroughly, periodical clear away of the contamination is necessary.

Ways of clear away the contaminations:

- Take away the radiator cover;
- Wipe out all the exotics on the radiator fins;
- Clean the radiator with abluent;
- Inspect the damaged radiator fins and rubber seal components.

### Notice

Do not wash the radiator with high pressure water.

### ★Check belt and pulley

Belt checking mode:

Press down each section of the belt, the downward distance should not exceed 10mm.

If the belt loose, to tighten it.

If still loose, replace that.

If belt abrasion, change another one.

### Notice

There may be bad influence to the coolant of the engine, normal working of the air condition and generator if the belt loose. Automatic tension pulley. Check the tightness of the spring device. Check the inner shaft of the device.

### ★Check the start-up、halt and operation of the engine

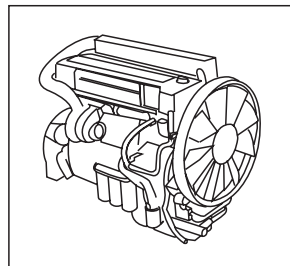
Follow steps should be abide by before start-up:

- Check all the oil level(engine、gearbox、hydraulic oil、drive axle、planet gear、brake coolant);
- Exhaust the air of fuel system;
- Turn the fire-key to start-up position, release it as the engine enable.

Do not let the engine work on the state of cold, neither too the critical low speed, working for 2-3 minutes on the state of 1200-1500rpm till the temperature gets normal is ok.

### Notice

It is important for the warm-up of the engine, which may ensure the smooth run of the engine oil before the high speed run of the turbine.



### ★Check oil、diesel or water leakage

Go around the machine, inspect the leakage of oil、diesel or water. If any part leaking, marking and cut off the power instantly.

### ★Check the leakage of the turbocharger and exhaust pipe

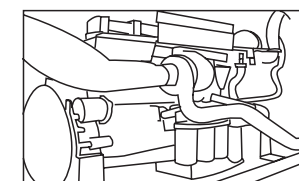
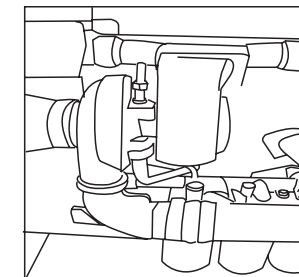
You must check the leakage situation of the pipe of turbocharger as well as the connectors of each gas hose before the start-up of engine. If leaking,



please change all the damaged seal rings、connected pipe. Once the vent of crankcase is blocked, the pressure will higher, the oil may pressed into the gas handing system of booster and engine.

### Notice

Never start the engine in the case of disengaged of turbocharger and exhaust pipe.

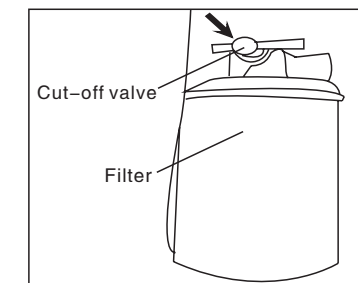


### ★change the filter core of cooling water

Firstly close the stop valve, get out the old core, lube the o-rings with lubrication, then tighten the new one by hand, screw it by half coil. In the end, open the stop valve.

### Notice

The liquid level of the expansion tank should be checked, refill that in time.



### ★Check the damping pad and fixed bolt if they are loose

It is essential to check if the damping pad damaged or the loose of the bolts before the start-up of engine.

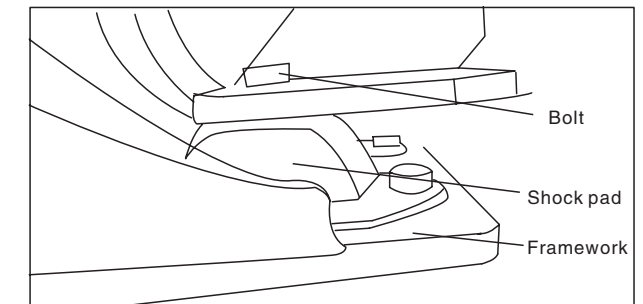
Function of damping pad:

Fasten the engine onto the frame work, which can

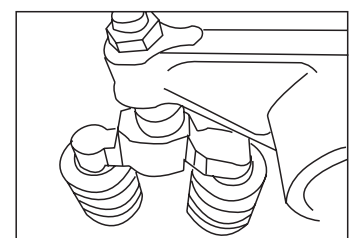
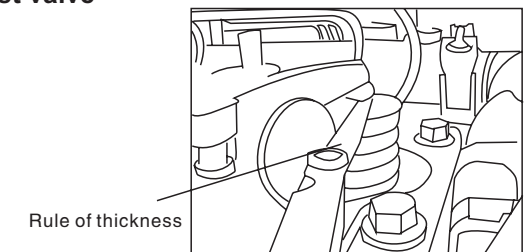
## MAINTENANCE OF THE EQUIPMENT

Container Reach Stacker Maintenance Manual

buff when start-up of the engine.



### ★Check and adjust the gap of inlet and exhaust valve



The open and close time of gas gate may be relevant to the gas gate cap.

It will be late if the cap big, and be earlier if narrow.

Way of adjusting the gap:

Turn the crankshaft to the position that the inlet valve just open but the outlet valve incomplete open. Check the valve gap, adjust it if necessary.

### Notice

The check sequence of the air valve is 1-2-3-4-5-6, and the observe sequence of rotational crankshaft is 6-5-4-3-2-1.

See User's Guide of "VOLVO Engine" and "Cummins Engine" for more details of use and maintenance.

## MAINTENANCE OF THE EQUIPMENT

Container Reach Stacker Maintenance Manual



### 3.2 Repairing and Maintenance of Transmission

#### ★Check and add the drive shaft oil

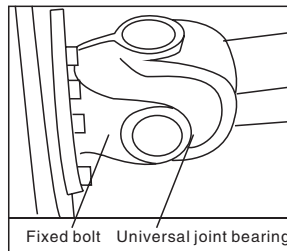
Let the engine run slowly, then draw the dipstick to oil place of the gear-box. Add the oil as told when the place is lower than the lowest station.

#### Notice

Select the right lubricating oil, according to the type of the gear-box.

#### ★Check the fixed bolts of the drive shaft

The loose bolts may be easily sheared in the action of load and vibration. The fixed bolts should be inspected carefully for fear of any accident.



Check measures:

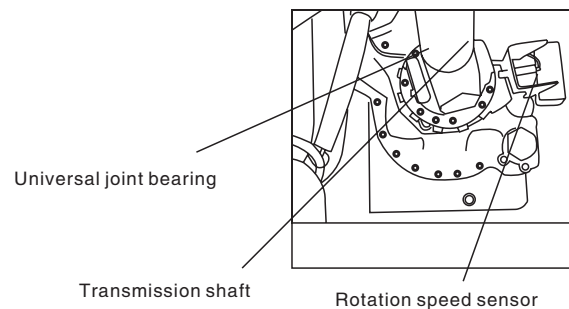
To see if the fixed bolts loose.

if the universal joint shaft damaged.

Relighted the loose shaft bolts with 200NM moment.

#### ★Check the speed sensor

Check the speed sensor and its support to see if the speed signal can be transferred correctly into the control system by the inductor. For the protection of driving device, make sure that only when low speed can the gear position be shifted.

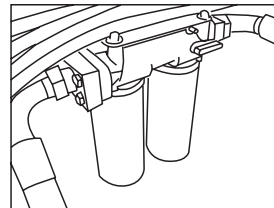


#### ★Change the gearbox filter

Block of filter will reduce oil volume of gear shift and lubrication.

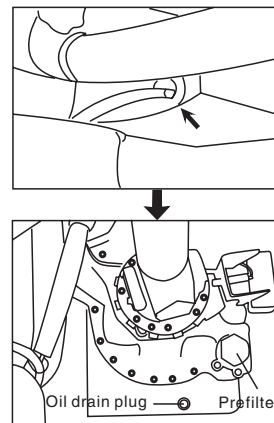
Change the filter core of gearbox:

Firstly detach the old core. Then the seal rings of the filter should be infiltrated by the fresh engine oil; tighten it by hand and then screw it tow-thirds coil.



#### ★Change the gearbox oil

Check if there is any prill in the old oil to see the working condition of gearbox components. If it has been polluted, open the fuel outlet, and give it off. As it is finished, first plug the outlet, then fill the oil to the min position level. Start the engine, let the oil reach the normal temperature, then check the oil dipstick, refill the oil to the max level position of oil dipstick.



#### Notice

Shell DonaxTD5W-30 shafting oil is adopted for DANA Clark 36000.

#### ★Check if the fixed bolts and fixed seating are loose

Action of fixed seating and damp pad:

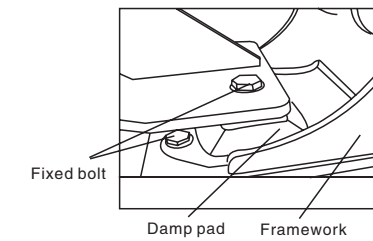
It plays a part of damping the vibration as the start-up, operation or halt of gearbox.



## MAINTENANCE OF THE EQUIPMENT

Container Reach Stacker Maintenance Manual

Check items: fixed seating, damping pad, bolts

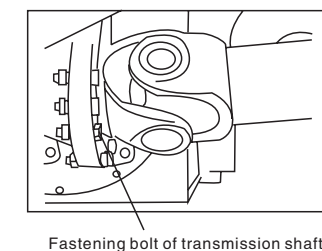
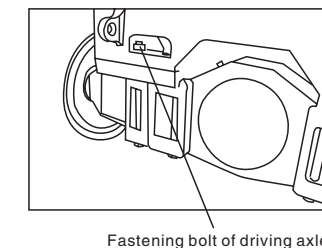


### 3.3 Repairing and Maintenance of the Drive Axle

#### ★Check the tightness of the fixed bolts of driving axle

Loose bolts may easily be cracked with load and vibration.

Fracture of bolts may do a serious impact to our device, and may even cause injuries and deaths.



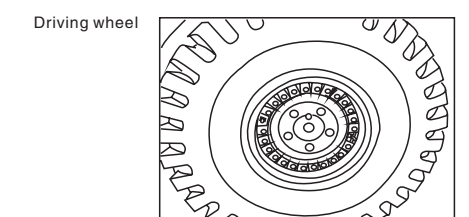
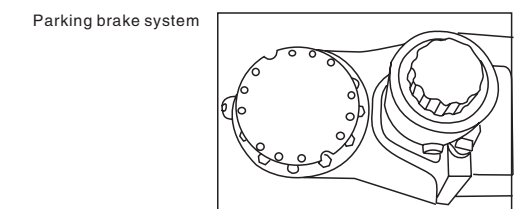
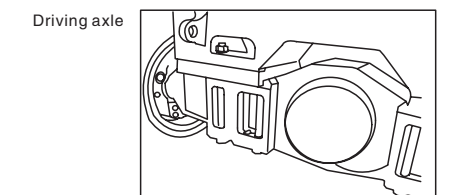
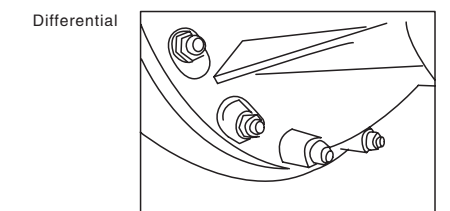
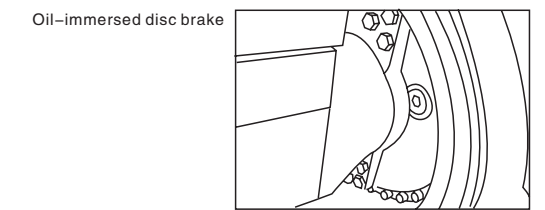
#### Notice

Tightness of bolts of drive axle: moment 1200NM

#### ★Check the leakage of driving axle and brake components

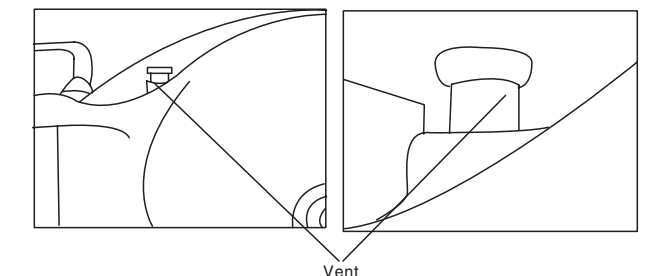
Check items:

Oil dipped disk brake and its connecting tube, parking brake system and its connecting tube, differential mechanism, drive wheel and drive axle.



#### ★Clean the connector of vent hole

The purpose of cleaning the connector of vent hole is to let the steam in the drive axle escape for fear of high pressure in the drive axle. If not, may bring about leakage of seal components.



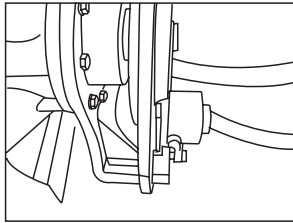
## MAINTENANCE OF THE EQUIPMENT

### Container Reach Stacker Maintenance Manual



#### ★Check the hand brake block and hand brake function

Start up the engine; do not stop it until the accumulator charging. Stop the engine, turn the fire key to position 1.release the parking brake, inspect that if the parking brake nipper can shift on the bracket, as well as the cap of brake gasket and Brake disk if it satisfied to the requirement, adjust it if necessary.



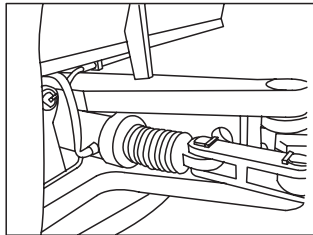
#### Danger

There may be danger of crush if machine shift freely, so in order to avoid accidents, make sure that the truck may not move even if the brake is released.

### 3.4 Repairing and Maintenance of the Steering Axle

#### ★Check if there exists the gap or damage of components of steering axle

Check steering cylinder、 joint shaft and joint bearing、 steering link rod、 damping pad、 and counterweight, if any component loose or any abnormal cap and damage as well as the leakage of the steering axle. if one of the cases occurred, deal with it immediately.



#### ★Check the anti-tipper inductor

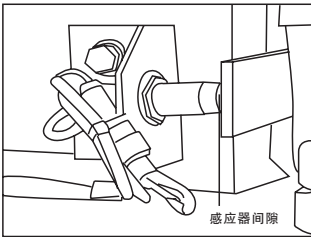
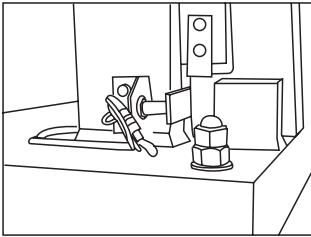
Function of anti-tipper inductor:

In normal condition, anti-tipper inductor is in normally closed state.When hoisting overload

causes carriage tail to tilt, the clearance between inductor and induce block will be enlarged, the induction will send no signal. With this mode, a kind of overload signal mill be formed, which make the container retain to current state for fear of accidents.

Before the machine lifting, please carefully inspect the reliability of inductor.

To find out if the sensor damaged as well as the reliability of angle-bar of induce block or bolts and if the space of inductor normal.



#### ★Check the tyre if deviate

In normal cases, all the wheels should swing to the same direction, and be parallel of the back wheel. If there is something serious, please check the linking structure.



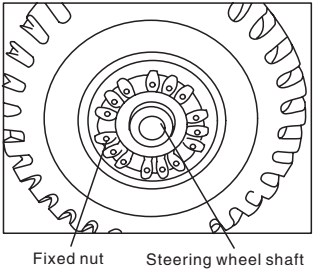
#### ★Check if the steering wheel shaft and fixed bolts loose

Check measures:

- Detach the wheel hub cover;
- Clean out the grease of wheel hub cover and steering wheel shaft;



- Detach the lock cushion ring and lock nuts;
- Tighten the nuts with the moment of 350NM; rotate the wheel hub for 10 loops;
- Tighten the nuts with the moment of 350NM again; check the spacer ring of wheel hub if it lies on the wheel axle. If not, retighten it;
- Mount on the lock nuts, tighten it with the moment of 350NM;
- Film the grease on the safety cover of shaft, then fixed on.

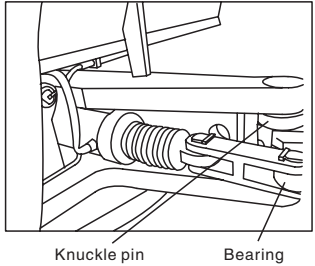


#### Notice

Take care of the abrasion state of shaft, change that immediately if damaged.

#### ★ Check if the knuckle-pin and fixed nut are loose

Clear out and check the shaft bearing. Check the knuckle-pin if it can roll smoothly, and the max rotate distance is not allowed to exceed 0.25mm.Free stroke can be adjusted by the nuts.



#### Notice

Find out the abrasion and loose components as early as possible and take some measures to give a precaution for fear of accelerate failure of some components.

## MAINTENANCE OF THE EQUIPMENT

### Container Reach Stacker Maintenance Manual

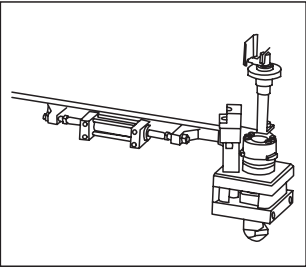
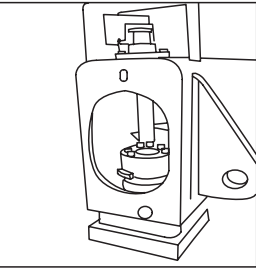
### 3.5 Repairing and Maintenance of the Spreader

#### ★Check the rotary-lock and its components

Check the rotary-lock components if damaged, change it if necessary. Check the position of rotary-lock link rod if correct and firm, adjust that if necessary.

#### Notice

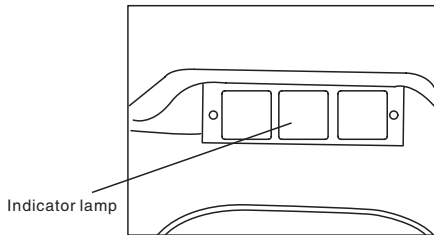
It is important to check the rotary-lock and its components because it plays a key role of lifting the containers correctly and safety.



#### ★ Check the status of rotary-lock inductor and indicator

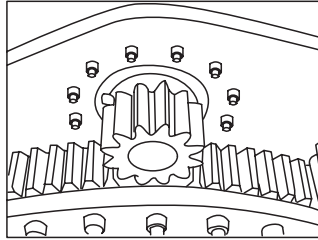
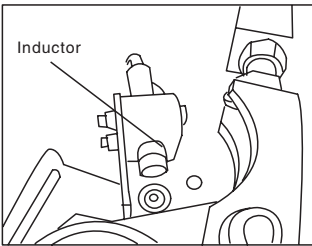
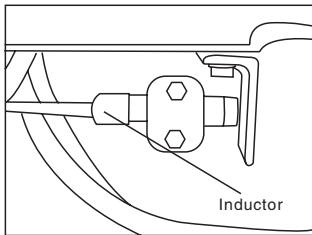
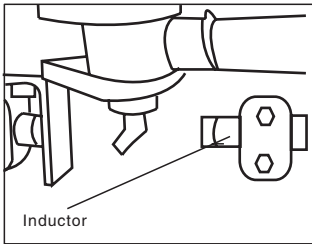
Check items:

- Each inductor and its connection status;
- Each inductor if not firmed or damaged;
- If the gap of inductor block normal;
- If the indication lights are in the normal operation state.



MAINTENANCE OF THE EQUIPMENT

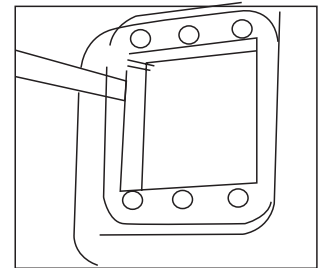
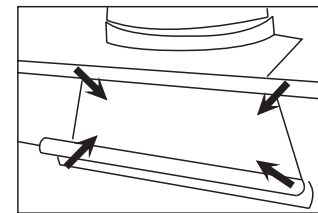
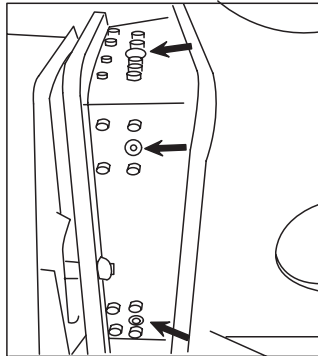
Container Reach Stacker Maintenance Manual



★Check abrasion status of the slide blocks in the spreader

There are two kinds of slide blocks on the spreader: side-slide blocks and 20'-40' extension blocks, which do an action of sustention and guiding.

Firstly detach the bottom strap, shim and slide block, then measure the thickness of slide blocks as well as the gap of slide block and slide components, adjust and change the shim if necessary, at last reinstall the strap.

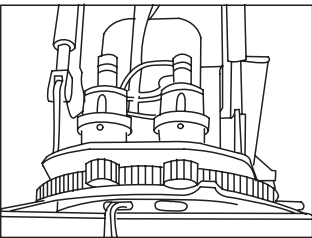


★Check if there exists the gap or damage of components of steering axle

Regularly inspection on the fixed bolts is necessary for fear of accidents caused by loose of bolts.

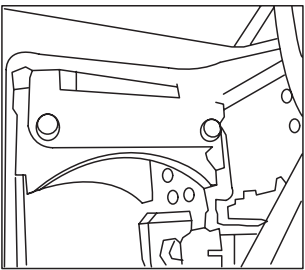
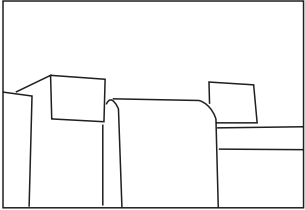
Rotary motor is composed of hydraulic motor, disk brake, planetary gear set, who are connected by fixed bolts.

The hydraulic motor lies on the upper of disk brake, which provides rotary power. Disk brake is something that avoids accidental rotation and followed by the rotation of hydraulic motor, which makes the brake released and spreader planetary gear rotated, so that the output of motor and disk brake will be enlarged.



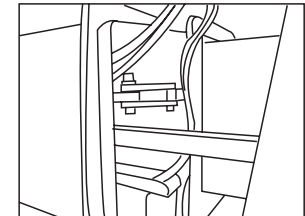
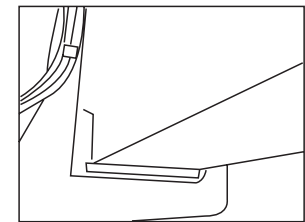
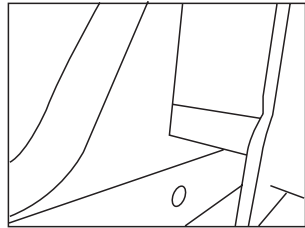
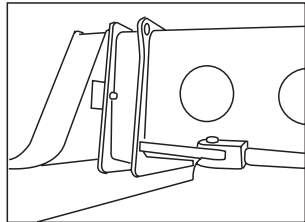
MAINTENANCE OF THE EQUIPMENT

Container Reach Stacker Maintenance Manual



★General observations of cracks

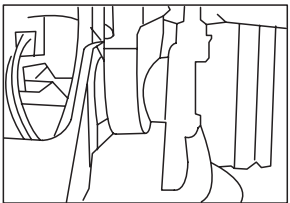
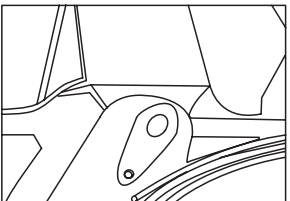
The spreader is the direct container-lifting device of the machine, usually inspection of the important components, to find out the cracks as early as possible is necessary.



3.6 Repairing and Maintenance of the Jib System

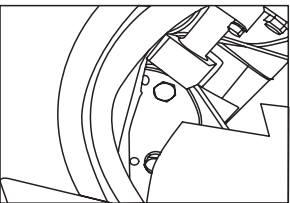
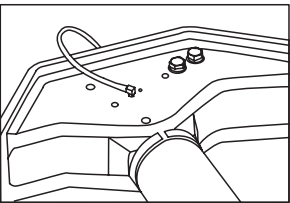
★Check the fixed seating and pin roll of the basic boom if loose or abrasion

The fixed seating and pin roll of the basic boom is the key components connected with frame and spreader. And the stability of structure and welding of fixed seating, pin roll, bearing of pin hole and fixed bolts should be checked periodically. Please color them if necessary.



★Check the fixed seating and pin roll of the pitch cylinder if loose or abrasion

Check if there is any crack around the fixed seating; please color it for next inspection if necessary.



★Check if the slide block of basic boom wears to extreme

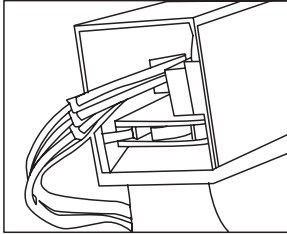
Firstly detach the strap, shim and slide block, then

## MAINTENANCE OF THE EQUIPMENT

### Container Reach Stacker Maintenance Manual

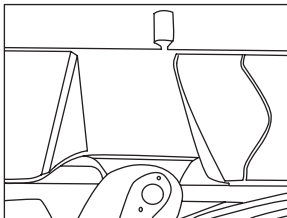
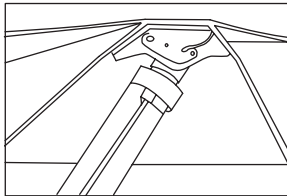
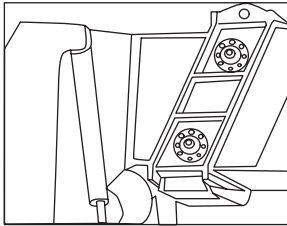


measure the thickness of slide blocks as well as the gap of slide block and slide components, adjust and change the shim if necessary, at last reinstall the strap.



#### ★General observations of cracks of basic boom

Usual inspection of the usage of basic boom, to find out the cracks as early as possible, then deal with that immediately for fear of deeper damage.



### 3.7 Repairing and Maintenance of the Air Conditioner System

#### Main checking items within 50 hours:

- Check transmission strap tightness of compressor and adjust it promptly;
- Check the leakage of each pipe connector. There might be leakage when the refrigerant connector has grease dirt;

- Check if the fixation of pipes is in good condition, pipes is over close to the heating component, rotary component and control rocker arm;
- Check if the connector of circuit harness is in good condition, harness fixation is solid. Pay special attention to the compressor clutch plug;
- Check if the fixed bolt of compressor is fastening;
- Check the fixed bolt of air conditioner is fastening;
- Take off fresh air filter core, blow the dust off from backside, and reinstall it.

#### Main checking items within 100 hours:

- Recheck the above checking items;
- Blow the condenser with compressed air. Don't use the high-pressure squirt gun;
- Clean out of the dirt on the condenser.

#### Main checking items within 200 hours:

- Recheck the above checking items;
- Change the fresh air filter core;
- Adjust the transmission strap tightness of compressor.

#### Notice

Add proper amount of coolant. Too much or too less would affect the cooling effect. Air conditioner should be started for several minutes every week in order to lubricate each component even in winter.

### 3.8 Repairing and Maintenance of Tyres

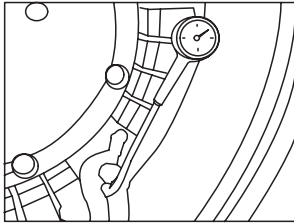
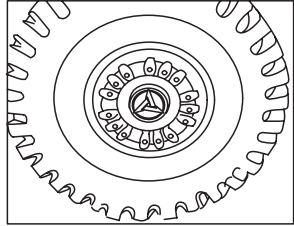
#### ★Check the tyre condition and pressure

Before starting the equipment, check if there is any cracks on the tyre surface, any corrosion and over-wear. Change the over-wear tyre. Check and clean dirt on the tyres, such as glasses, etc. Check tyre pressure, add it when it's too low. Low tyre pressure may have bad influence on stability and load capacity of the equipment.



## MAINTENANCE OF THE EQUIPMENT

### Container Reach Stacker Maintenance Manual

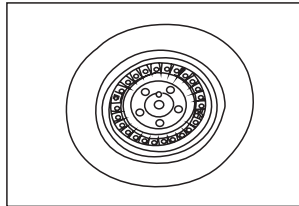


#### Notice

Don't over charge the tyre, keep the tyre pressure in a normal condition.

#### ★Check the tyre platen and nut tightness

Check the tyre nut tightness, Screw the rear axle nut with 350NM moment, front axle with 450NM moment.



#### ★Attention when changing the tyres

- If the tire treads at the 1/4 breadth of the tire is worn in 2~3mm, replace the tire;
- Old tyres can be replaced with retread tyres;
- Must use tyres appointed by Sany Group. Using different type of tyres may cause early damage of tyres or tyre explosion and endanger people and equipment;
- Changing dangers is companied with danger. Trained workers must follow the operation steps with proper tools. Any operation doesn't follow the standard schedule may cause explosion which has enough power to hurt even kill someone;
- Anyone without formally training is strictly forbade to install or dismantle tyres.

#### ★The Dismantlement of Tyre

- Before dismantling tire, deflate the tire to reduce the air pressure;
- While dismantling tire, do not use sharp tools; do not pry the tire bead forcibly; do not hit the tire with a big hammer.;
- While dismantling tire, replace the O-shape loop. Before installing felly, check the O-shape loop to see whether there are any defects and apply lubricant on it;
- While dismantling tire, use the bead detacher or tire detacher. Forcible prying and smashing should be prohibited to avoid damage to the sealing layer in the tire and bead. To facilitate the installation, neutral soap lye or special lubricant can be applied to the bead bottom and ring support of the felly. some lubricants, such as grease lubricant, which affect the quality of the tire, should not be adopted.

#### ★Installation of Tyres

- Install the tire in the felly, which is installed in the wheel hub. The direction mark on the side of the tire should be in consistency with the forward direction of the front-handling crane. The locating cone hole in the felly should match the outer cone of the hub to ensure the superposition of the felly center and the hub center;
- When the tire is pumped, the pumping pressure should be ensured at around 1Mpa;
- Install the pressure plate on the threaded stud of the hub and screw the hub nut. The hub nut should be screwed down gradually with symmetrical force. The moment of screwing down the hub nut is 350~370Nm. When the nut is screwed down, make sure 2~3 circles of screw thread of the stud expose;
- Test the installed tire by spinning it. Make sure the right-left amplitude of swing at the maximum outside diameter of the tire is less than 3mm.

## MAINTENANCE OF THE EQUIPMENT

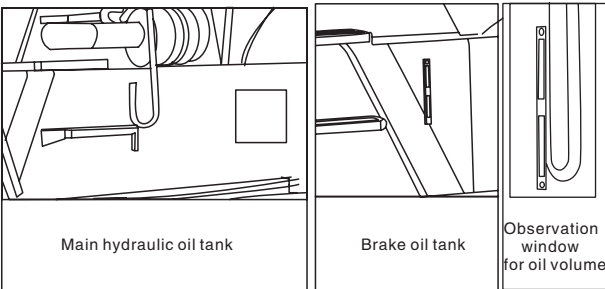
### Container Reach Stacker Maintenance Manual



### 3.9 Repairing and Maintenance of Hydraulic System

#### ★Check the oil volume of main hydraulic tank and brake tank

Check the oil volume of hydraulic tank and brake tank if it is sufficient by the window (the oil level height should exceed the red line, at the position of 3/4 of the window), if deficient please fill in.



#### Notice

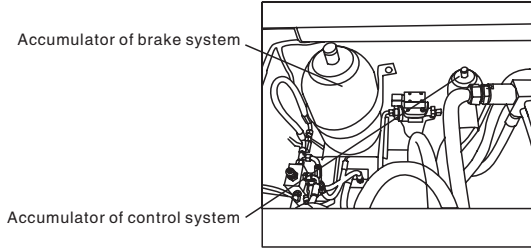
As checking the oil volume, all of the cylinder should retract to the original position.

#### ★Check the pressure of accumulator

There are two accumulators of hydraulic system: Brake system accumulator and control system accumulator;

Start the engine; let it rotate at idle speed for 5 minutes (the accumulator may not be charged completely until the charging valve of brake system accumulator shift to coolant loop). As the engine halted, turn over the start-up key to position 1, and then step on the brake pedal iteratively with under square mode and to keep a small period of time at stepping position each time. There can be at least 20 times brake before the warning light on, if not there may be some problems in the system; you'd better give a further inspection. There are also pressures testing joints, which can be measured directly.

Generally, the accumulator pressure of control system is satisfied to the requirement of control system.



#### ★Check the if hydraulic pressure is consistent with the hydraulic rating plate

— Test of the main system pressure

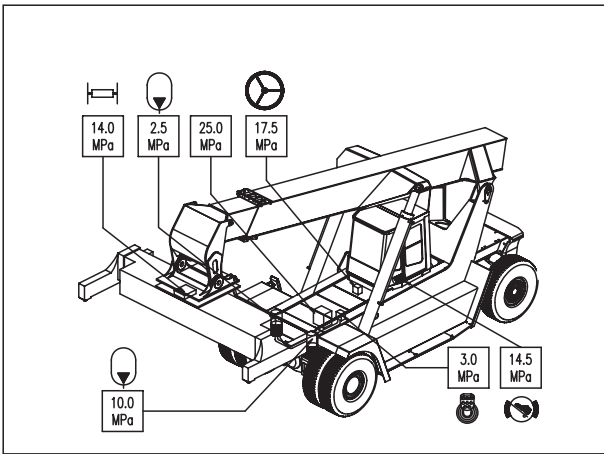


Diagram of hydraulic rating plate

Start the engine, to keep it in idle speed; there are two main pressure testing points, whose testing pressure should be the same. The result will be displayed on the screen.

— Brake pressure testing

Brake pressure should be  $14.5 \pm 0.5 \text{ MPa}$

#### Notice

Please step on the brake pedal as testing the pressure of brake system.

— Steering pressure testing

To keep the engine with medium speed, turn the steering wheel to only one direction. the max pressure you have got in this process is steering pressure. The valve is  $1.75 \pm 0.5 \text{ MPa}$ .

— Accumulator pressure testing

Start the engine, release the pressure, and get



the measured value (the max charging pressure) as the accumulator has been charged completely, then get another valve as the accumulator being recharged(initial charging pressure).  
The accumulator measured pressure is composed of brake system and control system testing pressure, whose rated pressure are 10 0.5MPa and 2.5 0.5Mpa individually.

— Spreader system pressure testing

The spreader system pressure is 14 0.5Mpa.

#### ★ Change the entire high pressure filter

Blocked filter may lower the flow of hydraulic oil, the movement speed of cylinder may be affected, besides, it will bring about to greater oil pump pressure to make the tube easy to burst. The hydraulic system is sensitive to the impurity; the tight damage of chromium piston rod may bring about the leakage of seal components.

#### Notice

Replace all the seal O-rings; change a new filter core with the moment of 140NM.

#### ★Change the hydraulic oil and brake oil

The oil may be worsened gradually by the effect of pollution and heat; metamorphous oil may accelerate the abrasion and erosion of components such as pump and valve, take periodical examination, change the hydraulic oil and brake oil.

Please adopt for the VG68G hydraulic oil at the tropical zone or long-time use place.

#### Notice

Do not forget to fill in the oil for main pump case first before you have finished the whole renewing of the oil.

#### ★Change the breather filter of main hydraulic tank and brake tank

The hydraulic system is sensitive to the impurity

## MAINTENANCE OF THE EQUIPMENT

### Container Reach Stacker Maintenance Manual

such as dust, sand, liquid and gas, the pressure of oil tank may be higher if the breather filter blocked, so periodically change the breather filter.

#### ★ Change the return oil filter

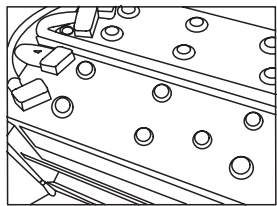
The flow may be hampered if the filter blocked, which bring about high pressure of outlet and burst of oil tube.

### 3.10 Repairing and Maintenance of Electric System

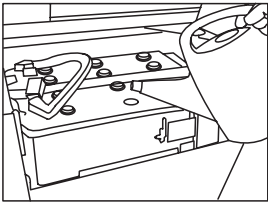
#### ★Check if there is enough battery water

Check the voltage of battery, which should be 23-25V as the engine halted 27-29V as the max speed.

As the engine powered off, turn off the main switch, tidy the battery, tie line and joints. Check all the connectors if they are tightened. Smear the grease on the binding post and connectors, put a rubber gasket under the battery for fear of drain, and check the height of electrolyte, which should be 10-15mm higher than the battery, fill with the plasma water when it is not enough.

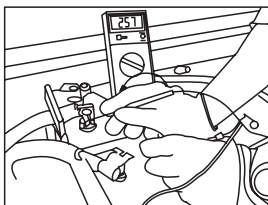


Battery



Add electrolyte

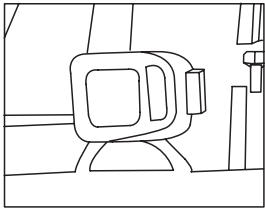
Test voltage



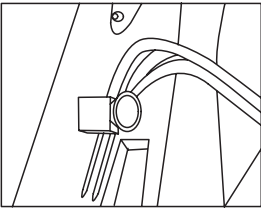
#### ★Check all the work light and indication light

Turn on all the work lights and indication lights, to see if they are normal.

LUBRICATING

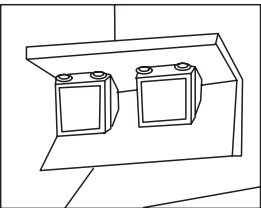


Front headlamp



Rear headlamp

Boom lamp

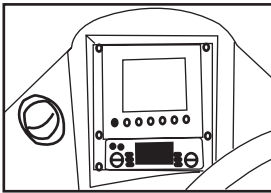
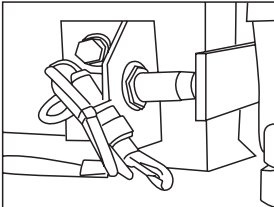


★Check horn, reverse buzzer and rotary warning light

Turn on the horn, reverse buzzer and rotary warning light to check they are working.

★ROPS system test

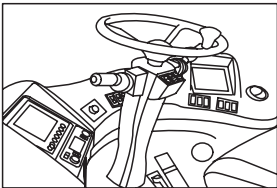
Test if the ROPS system is working. Once the controller get the front tilting signal, it would lock the motion immediately (except contraction), give a warning and flash the red light. The signal would get through relay to control the front red acousto-optical alarm prompt. Once the controller gets the signal, that red light would turned on, display screen will also have the malfunction warning signal.



★Test the Rotary-lock safe interlocking device system

Before turning on the rotary lock, check if all the standby lights (green) is on; while the rotary isworking , check if all the sensor light (yellow) is on; check if clearance between sensor and sensing block is normal, if there is any sign of abnormal, treatment should be taken promptly.

★Test the overall function of hydraulic system  
Operate the electro-hydraulic control handler; test all the hydraulic functions such as pitch and contraction of jib, expansion, contraction and sideshift of spreader. Find out parts that need adjustment.



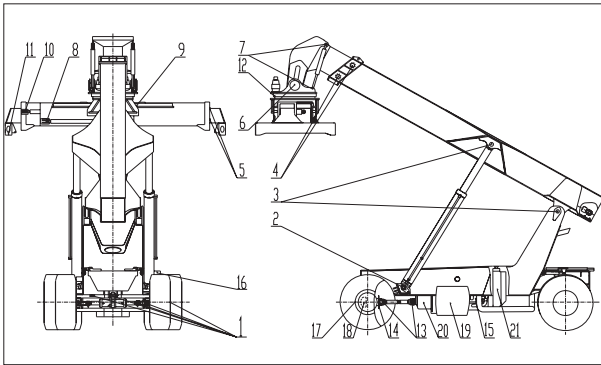
4.Lubricating

4.1 Lubrication

Add lubricant coating in order to ensure the smooth rotation and sliding parts, not sufficient lubrication can cause issuing and excessive wear parts. Lubricant is to guarantee the normal operation of machine of lubricating necessary materials.

Reach stacker use Mobil EP2 hanging type automobile universal lithium grease, banning the use nonspecified lubricant by Sany Group. Lubricating (butter) method:  
Firstly clean the grease fitting, do not stop to inject the butter with the grease gun until the old grease is forced out.

4.2 Lubricating Table



LUBRICATING



Lubricating Table of the Machine

| Lubricating points                              | Brand                                                | Amounts | Cycle              |
|-------------------------------------------------|------------------------------------------------------|---------|--------------------|
| Steer axle                                      | Mobil lubricating grease EP2                         | 15      | 60 h or every week |
| Pitching cylinder fulcrum                       |                                                      | 2       |                    |
| Lubricating pump                                |                                                      | 4       |                    |
| Jib extension and contraction lubricating block |                                                      | 14      |                    |
| Extension and contraction surface of spreader   |                                                      | 6       |                    |
| Pivot of jib and spreader                       |                                                      | 2       |                    |
| Damping cylinder lug of spreader                |                                                      | 4       |                    |
| Sideshift cylinder lug of spreader              |                                                      | 4       |                    |
| Sideshift surface of spreader                   |                                                      | 4       |                    |
| Extension-contraction cylinder lug of spreader  |                                                      | 4       |                    |
| Rotary lock of spreader                         |                                                      | 8       |                    |
| Turntable slewing bearing of spreader           |                                                      | 4       |                    |
| Transmission axle                               |                                                      | 3       |                    |
| Parking brake                                   |                                                      | 1       |                    |
| Diesel engine                                   | Shell Diesel engine CG-415W40                        | 1       | 250 h              |
| Brake oil tank                                  | Shell transmission oil DonaxTD5W-30                  | 1       | 1000 h or one year |
| Reducer of driving axle                         | Shell gear oil VG150 ( >0? )                         | 2       | 1000 h or one year |
| Differential of driving axle                    | Shell gear oil VG150 ( >0? )                         | 1       | 1000 h or one year |
| Hydraulic oil tank                              | Shell anti-wear hydraulic oil VG46T                  | 1       | 2000 h or one year |
| Torque converter                                | Shell multi-function transmission oil Donax TD 5W-30 | 1       | 2000 h or one year |
| Engine radiator                                 | Shell antifreeze (freezing point-45°C)               | 1       | one year           |

FUNCTIONAL OIL

Container Reach Stacker Maintenance Manual



5.Functional oil

5.1 Oil specification

Use correctly the fuel, the hydraulic liquid, the lubricating oil and the cooling liquid which SANY Group recommends in written form. Check the quantity and quality of all functional liquids regularly. The equipment cannot start operation unless all functional liquids satisfy the needs of the equipment.

| Type                                    | Brand                                                   | Specification                     | -30   -20   -10   0   10   20   30 |  |  |  |            |  |  |  |
|-----------------------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|--|--|--|------------|--|--|--|
|                                         |                                                         |                                   |                                    |  |  |  |            |  |  |  |
| Fuel                                    | Diesel oil                                              |                                   | -20#                               |  |  |  |            |  |  |  |
| Engine oil                              | Shell diesel engine<br>CG-415W/40                       | API Classification<br>CC or above | SAE10或<br>SAE10W/30                |  |  |  | SAE30      |  |  |  |
|                                         |                                                         |                                   |                                    |  |  |  | SAE20W     |  |  |  |
| Driving axle<br>oil                     | Shell gear oil<br>VG150(>0℃).<br>VG100(≤0℃)             | GL5                               | SAE80W                             |  |  |  | SAE90      |  |  |  |
| Transmission<br>torque<br>converter oil | Shell transmission oil<br>DonaxTD5W-30                  |                                   | SAE10W/30                          |  |  |  |            |  |  |  |
| Hydraulic oil                           | Shell anti-wear<br>hydraulic oil<br>VG46T ( >0℃ ) Shell |                                   | SAE10 ~ 20W                        |  |  |  | SAE30 ~ 40 |  |  |  |
| Transmission<br>cooling oil             | transmission oil<br>DonaxTD5W-30                        |                                   | SAE10W                             |  |  |  | SAE20W/40  |  |  |  |
| Lubricatiing<br>oil                     | General lithiumed oil                                   |                                   | Maypoles oil EP2                   |  |  |  |            |  |  |  |
| Antifreeze                              | Shell antifreeze<br>(freezing point-45                  |                                   | -45℃                               |  |  |  |            |  |  |  |

Oil features are different from different manufacturer, so client should use recommended oil.



FUNCTIONAL OIL

Container Reach Stacker Maintenance Manual

5.2 Oil Capacity

You must use the right Fuel、Hydraulic Liquid、Cooling Liquid as SANY test says, and check the quality and quantity of all the liquid often. Only all the liquid has good quality and enough quantity, the engine is able to work.

Capacity Table

| Item                              | Capacity (L) |
|-----------------------------------|--------------|
| The Fuel Tank                     | 470          |
| The Hydraulic Liquid              | 900          |
| The Engine Cooling Liquid         | 50           |
| The Gear-box and Torque Converter | 60           |
| The Driving Axle                  | 49           |
| The Wheel Reductor                | 2 11         |
| The Engine Oi                     | 35           |
| The Brake Oil                     | 150          |

Notice

The capacities in the above table are for reference.  
The oil level indicator is placed on the side of the oil tank in order to check the oil level in the tank.

5.3 Check and Change of Hydraulic Oil

The Shell brand antiwar hydraulic liquid is adopted for this machine. The hydraulic liquid in the tank should be checked every 6 months in the forms of the appearance appraisal and quality analysis. The appearance appraisal refers to estimating whether the performance of the hydraulic liquid deteriorates. Please see the following table:

Appearance Appraisal of Hydraulic Liquid

| Phenomenon                                                | Contaminant      |
|-----------------------------------------------------------|------------------|
| Darkening Color                                           | Oxygen           |
| Milky White                                               | Water or Bubbles |
| Bubbles                                                   | Air              |
| Floating Impurities or Sediments                          | Solid Particles  |
| Separation of Oil and WaterSeparation<br>of Oil and Water | Water            |

The quality analysis refers to regular laboratory tests made on various items, including the viscosity, oxidization, water content, additives and cleanliness. They will be compared with the normal value to determine whether the hydraulic liquid needs to be replaced. Among the items, the cleanliness is the major one which indicates the quantity and size of the solid particles in the hydraulic liquid.  
This system's requirement on the cleanliness of the hydraulic liquid equals to level 8 or level 9 in NAS1638 which is comparable to 17/14 level of ISO standard. Please see the two tables:

NAS1638 Standard

| The Level Of<br>Cleanliness | The Size of Solid Particles ( μ m ) |         |         |          |      |
|-----------------------------|-------------------------------------|---------|---------|----------|------|
|                             | 5 ~ 15                              | 15 ~ 25 | 25 ~ 50 | 50 ~ 100 | >150 |
| Level 7                     | 32,000                              | 5,700   | 1,012   | 180      | 32   |
| Level 8                     | 64,000                              | 11,400  | 2,025   | 360      | 64   |
| Level 9                     | 128,00                              | 22,800  | 4,050   | 720      | 128  |

Notice

The level 8 in the NAS1638 indicates that, in the 100ml oil sample, the number of the particles with the size of 5~15m will not exceed 64,000; the number of those with the size of 15~25m will not exceed 11,400, so on and so forth.

The ISO Standard  
(DIS4406, SAEJ1165)

| Level of<br>Cleanliness | The Size of the Solid Particles ( μ m ) |        |
|-------------------------|-----------------------------------------|--------|
|                         | >5                                      | >15    |
| 16/13                   | 16,000                                  | 8,000  |
| 17/14                   | 125,000                                 |        |
| 18/15                   | 250,000                                 | 32,000 |
| 19/16                   | 500,000                                 | 64,000 |

Notice

The cleanliness level 17/14 in ISO standard indicates that, in the 100ml oil sample, the number of the particles with the size above 5m should not exceed 130,000; the number of those above 15m should not exceed 16,000.

FUNCTIONAL OIL

Container Reach Stacker Maintenance Manual



During utilization, the particle contamination level in the hydraulic liquid in the tank should not exceed 18/15 (which is comparable to NAS10 level)

The hydraulic system of this machine has the following items for oil change:

Variations of viscosity: 10

The increase of acid number: 0.1~0.25mgKOH/g

Moisture: <0.1%

Mechanical Impurities: 5%

Variations of density (15C/4C): 0.05

Copper sheet erosion: disqualification

Rust preventing ability: disqualification

Ash content: 0.05%

Variations of surface tension: 15 dyne/cm

Residue carbon: 0.05~0.10

Variation of color (Union grade): above +2

The hydraulic liquid, the checking results of which are not up to the requirement, should be changed in time. The change of oil should follow the following steps:

— Remove the plug on the bottom of the hydraulic oil tank to drain the hydraulic oil in the tank and pipe.

— Open the hydraulic oil tank to clean the hole cap.

— Use the cleaning liquid (diesel, etc.) and paste to clean the oil tank.

— If it is qualified after being checked and cleaned, the cleaned hole lip should be installed back.

— Add oil to the tank: Open the air filter lip on the top of the oil tank. Add the hydraulic oil filtered by 5m filter (filtering car) to the oil tank through the filter element until reaching the full scale of the oil indicator.

5.4 Using Principle of Oil

Working temperature of brake oil and hydraulic oil don't exceed 80℃,selecting principles are:

Brake oil:

Hydraulic oil No.46 + Additive LZ9990A,

Proportion: + 5.8%~6.5% (Suitable environment temperature >-5℃)

Hydraulic oil No.32T +Additive LZ9990A,

Proportion: + 5.8%~6.5% (Suitable environment temperature >-5℃)

Hydraulic oil type:

Shell hydraulic oil No.68 (Suitable environment temperature≥35℃)

Shell hydraulic oil No.46 (Suitable environment temperature 35℃~-5℃)

Shell hydraulic oil No.32T (Suitable environment temperature≤-5℃)

Southern area of China (All year long)

Brake oil—Hydraulic oil No.46+AdditiveLZ9990A,

Proportion: 5.8%~6.5%

Hydraulic oil—Shell hydraulic oil No.46

Guangdong province (China), Southeast Asia, Brazil, New Zealand etc, areas

Brake oil—Hydraulic oil No.46+Additive

LZ9990A, Proportion: 5.8%~6.5%

Hydraulic oil—Shell hydraulic oil NO.68

Northern area of China, Germany, Sweden, America, Australia etc, areas

Brake oil—Hydraulic oil No.32T + Additive

LZ9990A, Proportion: 5.8%~6.5%

Hydraulic oil—Shell hydraulic oil NO.32T

Severe cold region (temperature lower than-25℃),Russian, Canada etc, area

Brake oil—Hydraulic oil No.32T + Additive

LZ9990A, Proportion: 5.8%~6.5%

Hydraulic oil—Shell hydraulic oil No.32T

Changing period:

Hydraulic oil—Running-in of new equipment:

change it after 50 h ;second time: 500h , following changing period: 1000h

Hydraulic oil—Running-in of new equipment:

Change it after 50h; following changing period:

2000h

Notice

when the environment temperature is under 0℃, equipment has to be warming-up for one hour.



CHECKING OF KEY BOLTS

Container Reach Stacker Maintenance Manual

6.Checking of Key Bolts

Before start, carefully check fastening status of key bolts. Loose bolts will possibly cause acute shaking, damaged parts, weak function, broken bolts, and other dangerous phenomena, and, periodic check will avoid accidents.

The following items of the bolt should be carefully checked:

— Checking of fixed bolt of engine

— Checking of fixed bolt of torque-converter

— Checking of fixed bolt of transmission shaft

— Checking of fixed bolt of drive axle

— Checking of fixed bolt of crane spreader rotary gear case

— Checking of fixed bolt of tyre pressure plate

Notice

If the bolts are loose, please check it with torque spanner and screw the bolts and nuts to torques according to figures in the following table. If bolts or nuts are broke, they should be replaced with equal or higher standard bolts or nuts.

Fastening Torque Standard

| Standard Nut and Bolt  |                                   |                        |                                   |
|------------------------|-----------------------------------|------------------------|-----------------------------------|
| Screw Thread dimension | Standard Fastening Torque ( N.m ) | Screw Thread dimension | Standard Fastening Torque ( N.m ) |
| M6                     | 12 3                              | M14                    | 12 3                              |
| M8                     | 28 7                              | M16                    | 28 7                              |
| M10                    | 55 10                             | M20                    | 55 10                             |
| M12                    | 100 20                            | M30                    | 100 20                            |

Bolts' Fastening Torque of Main Components (Undetermined)

| Bolt dimension                                   | Recommended fastening torque(Nm) |
|--------------------------------------------------|----------------------------------|
| M12 1 20Fixed bolt of engine                     | 75 5                             |
| M16 70<br>Fixed bolt of torque converter         | 200                              |
| M12 130<br>Fixed bolt of transmission axle       | 65                               |
| M24 360Fixed bolt of driving axle                | 1150                             |
| M24 2 Fixed bolt of tyre platen                  | 980                              |
| M30 2<br>Fixed bolt of steering cylinder         | 475 1 0                          |
| M30 1 40<br>Fixed bolt of up/down counter weight | 1600 1 0                         |

Notice

— Make sure thread on the bolts and nuts are clean before install them.  
— Lubricate the bolts and nuts to stablize their friction coefficient.  
— If the bolts of counter-weight are loose, screw up immediately; please connect your nearest and Sany service engineer.  
— Standard measurement of torque is Nm:  
For example: Screw bolt or nut with a spanner(1m) with 120N force twisting the spanner end, which would generate following torque: 1m\*120N =120Nm  
Same torque by using a 0.25m spanner:  
0.25m\*y=120Nm  
Needed force: y=120Nm\0.25m=480N

SAFTY REGULATIONS DURING MAINTENANCE WORK

Container Reach Stacker Maintenance Manual



7.Safty Regulations during Maintenance Work

Safety regulation while maintenance, checking and lubricating.

- ★Safety regulations in working place:
  - Make sure equipment parked in a safe place;
  - Segregate a safe area with a ribbon if necessary;
  - Arrange a signaler to assist the work if necessary.
- ★Safety regulations of product:
  - Use warning sign;
  - Cut off or lock the electric power switch to prevent unauthorized reenergize;
  - Release the electric power or discharge the storage energy liquid power, gas power or electric power;
  - Regarding to information of certain situations and working conditions which haven't included in this manual, please ask manufacturer for help.
- ★Safe protection of persionnel:
  - Must wear working clouth, helmet and safe shoes while working;
  - Safty belt must be weared while working in high position;
  - Hang the warning brand of “stop, in repairing” on the equipement.

8.Common Faults and Measures

8.1 General

The machine can finish the operations such as pile; fetch containers and operating with containers. It must bring some certain impacts to users on the progress of work, economic and social benefits, etc. when the faults occur. With a timely diagnosis and elimination, the customers can restore the economic losses and keep our corporate image. This section will state the common faults of machine and give elaboration corresponding to the measures in three major aspects of mechanical system, hydraulic system, and electrical control system.



COMMON FAULTS AND MEASURES

Container Reach Stacker Maintenance Manual

8.2 Common Faults of Mechanical Systems and Measures

Table 8-1 Common Faults of Mechanical Systems and Measures

| Category           | Faults                                   | Cause of faults                                                                                                                              | Measures                                                                                                                                         |
|--------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Engine is abnormal | Difficult to start up                    | Temperature is too low ; preheating time is short; Air filters or air intake jammed; Thermostat is failure; Starting voltage is insufficient | Fully preheating of engine; Check whether the engine gas handling system jammed; Check fuel oil system; Check thermostat; Check battery voltage. |
|                    | Engine high-speed                        | EDC fuel control unit has problem                                                                                                            | Engine high-speed                                                                                                                                |
|                    | Bellows cracks with air-leakage          | Self-faults                                                                                                                                  | Replace                                                                                                                                          |
|                    | Engine speed up with difficulty          | EDC fuel control unit with problem                                                                                                           | Check the EDC fuel control unit                                                                                                                  |
|                    | Engine parking by itself                 | No oil in tank; oil-pipe plugs ; air enters into oil-pipe                                                                                    | Check whether the fuel is out; Check whether oil line plugs or enters with air                                                                   |
|                    | Engine temperature is too high           | Lack of water coolant; Thermostat failure; The fan belt is loose; The water pump is damaged                                                  | Check whether coolant water is enough; Check thermostat; Check whether the fan belt is loose; Check water pump                                   |
|                    | The water with oil but oil without water | Engine Oil Cooler is damaged                                                                                                                 | Check whether the oil cooler is damaged                                                                                                          |
|                    | Cylinder head Cracks                     | Self-faults / coolant is not enough                                                                                                          | Replace; Check whether the coolant is enough                                                                                                     |
|                    | Fuel level of oil sump tank (with water) | Cylinder head or cylinder body cracked; cylinder liner water                                                                                 | Check whether cylinder head or cylinder body crack; Check whether cylinder circle damage                                                         |
|                    | Lubricating oil pressure is too Low      | Low-oil level; oil filter jammed; lubricating oil is too thin                                                                                | Add or replace lubricating oil; Replace filter                                                                                                   |
|                    | Water leakage                            | Water tank is damaged                                                                                                                        | Replace                                                                                                                                          |
|                    | Oil radiator leakage(gearbox)            | Oil radiator is damaged                                                                                                                      | Replace                                                                                                                                          |
|                    | Engine power is not enough               | Insufficient fuel; Diesel does not meet the quality requirements; The air intake jammed                                                      | Check whether the fuel oil circuit flows smoothly; Check whether the air intake is smooth; Use the appointed fuel                                |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category            | Faults                                                     | Cause of faults                                                                                                                                                                           | Measures                                                                                                                                                                                                                       |
|---------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engine is abnormal  | Automatic deceleration of the engine                       | Oil supply is not smooth                                                                                                                                                                  | Check whether the fuel circuit flows smoothly                                                                                                                                                                                  |
|                     | The diesel rough filter and second filter of engine jammed | Diesel is too dirty; the cleanliness of diesel box is not enough                                                                                                                          | Use the clean diesel;<br>Clean the oil tank                                                                                                                                                                                    |
|                     | Engine exhaust pipe leakage                                | Exhaust pipe is damaged; exhaust pipe joint is not sealed enough                                                                                                                          | Check the leakage position and repair                                                                                                                                                                                          |
|                     | Engine fan belt broken                                     | Self-faults; the belt is too tight                                                                                                                                                        | Replace the belt;<br>Adjust the belt tension                                                                                                                                                                                   |
|                     | Engine with blue-smog                                      | Wear intensity between air valve and guide tube becomes larger; oil scraper ring is damaged                                                                                               | Replace air valve or guide tube;<br>Replace oil scraper.                                                                                                                                                                       |
|                     | Engine speed up with difficulty                            | EDC fuel control unit with problem                                                                                                                                                        | Check the EDC fuel control unit                                                                                                                                                                                                |
|                     | Engine supercharger with oil leakage                       | Supercharger sealing component is damaged                                                                                                                                                 | Replace the sealing components                                                                                                                                                                                                 |
|                     | Fuel meter shows wrongly                                   | Fuel meter or liquid level sensor is damaged                                                                                                                                              | Check fuel meter and liquid level sensor                                                                                                                                                                                       |
|                     | Oil seal of engine front crankshaft with leakage           | Self-faults                                                                                                                                                                               | Replace                                                                                                                                                                                                                        |
| Gearbox is abnormal | Clutch slipping                                            | Low oil pressure、low oil level、charging pump is damaged、Clutch abrasion and invalidation                                                                                                  | Check the oil level;<br>Check the charging pump;<br>Change the clutch                                                                                                                                                          |
|                     | High oil temperature                                       | Low oil level、charging pump is damaged、high oil level、too much working hours on fallback condition of torque converter、the clutch cannot break away in the condition of long period brake | Check the charging pump;<br>Check the oil level of luboil;<br>To avoid to make the torque converter work on the condition of fall-back mode;<br>Step on the clutch switch as brake, check the clutch switch if it is available |
|                     | Big noise                                                  | Gear mesh with problem、shaft bearing abrasion or damaged                                                                                                                                  | Check the gear mesh condition;<br>Change the damaged or abrasion shaft bearing                                                                                                                                                 |
|                     | Deficiency pressure of oil pressure gauge                  | Low oil level、charging pump is damaged、pressure control valve of clutch is damaged, oil seal components of clutch is damaged                                                              | Check the charging pump;<br>Check the pressure control valve;<br>Change the damaged seal components                                                                                                                            |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category               | Faults                      | Cause of faults                                                                         | Measures                                                                                                                                                     |
|------------------------|-----------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gearbox is abnormal    | Gearbox cannot shift        | Gearbox control unit with problem                                                       | Check the signal of gearbox control unit if it is normal、check the magnetic coil of gearbox magnetic valve if it is burn-out、the valve core if it is blocked |
| Drive axle is abnormal | Foot brake force not enough | Low brake oil pressure、oil brake circuit with air、brake block abrasion and invalidation | Check weather brake oil leakage                                                                                                                              |
|                        |                             | High temperature of brake oil                                                           | Check the fans of cooler system change the flabellum if they were damaged                                                                                    |
|                        | Big noise                   | Gear damaged、shaft bearing wear or damaged                                              | Replace the wear and damaged components                                                                                                                      |
| gear change handle     | Manual shift is incapable   | Contact Failure                                                                         | Inspect the contact                                                                                                                                          |
| Work Handle            | Joystick failure            | Contact Failure                                                                         | Inspect the contact                                                                                                                                          |
| Traversing machine     | Angle adjustment failure    | Retaining mechanism Failure                                                             | Check the retaining mechanism                                                                                                                                |
| Cab mobile mechanism   | Cab cannot move             | Brake cylinder cannot release                                                           | Check the oil circuit of brake cylinder                                                                                                                      |
| Cab shock damper       | Cab vibration; big noise    | Tighten the loose bolt                                                                  | Tighten loose bolt                                                                                                                                           |



8.3 Common Faults of Hydraulic System and Measures

Table 8-2 Common Faults of Hydraulic System and Measures

| Category        | Faults                                              | Cause of faults                                                                                                                         | Measures                                                                                                                                                              |
|-----------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Boom System     | Libration phenomena as the boom retraction          | Magnetic valve blocked                                                                                                                  | Clean the magnetic valve                                                                                                                                              |
|                 | Automatic retraction of the boom                    | ①Internal drain of telescoping pitching cylinder<br>②Self-lock function of logic valve invalidation                                     | ①Strip inspection and change the seal components<br>②Check the logic valve                                                                                            |
|                 | No pitch、telescoping of the boom                    | ①Low oil pressure<br>②Logic valve with problem<br>③Only one movement of differential magnetic valve                                     | ①Check and adjust the pressure valve of between pump and main valve<br>②Check the logic valve<br>③Check the electrify state of differential magnetic valve            |
|                 | The boom can not reach its position                 | ①Low oil tank level<br>②Cushion protection distance of telescoping cylinder is too large<br>③Deficiency pressure of the system          | ①Add the hydraulic oil to the tank<br>②Minish the cushion protective distance<br>③Increase the working pressure of the system                                         |
| Spreader System | No pressure in the system                           | ①Overfall valve、relief pressure valve damaged or valve core blocked<br>②No output of oil pump                                           | ①Change and clean the overfall valve、relief pressure valve<br>②Check the oil pump feedback oilcircuit                                                                 |
|                 | Without movement                                    | ①Electrical Fault<br>②Magnetic valve is damaged or the spool is locked                                                                  | ①Change the circuit<br>②Clean or change the magnetic valve                                                                                                            |
| Brake System    | Without foot brake valve the brake function failure | ①Brake valve failure<br>②Brake Failure<br>③Pressure Relay Fault<br>④Accumulator Failure<br>⑤Gear pump Fault<br>⑥Brake valve block fault | ①Adjust the distance of brake valve<br>②Check the clearance of brake block<br>③Clean or Replace<br>④Replace<br>⑤Replace the gear pump<br>⑥Clean or Replace the valves |



| Category        | Faults                                     | Cause of faults                                                                                                                                                                                                                                                                                                                                | Measures                                                                                                                                                   |
|-----------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Brake System    | Without the handbrake or handbrake failure | ①Parking brake failure<br>②Magnetic valve failure<br>③Feed pump Failure<br>④Shuttle Valve Failure                                                                                                                                                                                                                                              | ①Clean the parking brake<br>②clean the magnetic valve or change<br>③check the return line<br>④Clean or Replace                                             |
| Steering System | Poor or not to shift                       | ①Insufficient fuel supply<br>②Hydraulic steering gear failure<br>③Serious leakage of steering cylinder<br>④Prefill valve Failure                                                                                                                                                                                                               | ①check the system pressure<br>②clean and replace<br>③change the seal components<br>④clean                                                                  |
| Cooling System  | High oil temperature                       | ①cooler failed<br>②Air-cooled hydraulic motor of cooling circuit is damaged, made inadequate wind<br>③Oil supply of loop feed pump is not enough<br>④Inter drain of change valve is serious<br>⑤low flow of cooler<br>⑥out radiator is too dirty                                                                                               | ①replace<br>②change the hydraulic motor<br>③change the back pressure spring<br>④change the reversing valve<br>⑤clean the cooler<br>⑥swash the out radiator |
| Hydraulic Oil   | Hydraulic oil pollutes and goes bad        | ①Use the substandard quality hydraulic oil<br>②Use the substandard viscosity hydraulic oil<br>③Long-term use of hydraulic oil without filter or change<br>④The constant input of dust, sand and other debris<br>⑤High temperature; oxidation metamorphism<br>⑥Enter with water and air, as a result of cavitation erosion etc.<br>⑦Filter plug | Check the mass of hydraulic oil;<br>Periodic filtration<br>Change the filter core periodically<br>Change the hydraulic oil                                 |
|                 | Leakage of hydraulic oil                   | ①seal components damaged or distorted<br>②joints、pipelines are free                                                                                                                                                                                                                                                                            | ①change the seal components<br>②tighten the loose parts                                                                                                    |

COMMON FAULTS AND MEASURES

Container Reach Stacker Maintenance Manual



8.4 Common Faults of Electrical Control System and Measures

Due to the complexity of malfunction of electric-control system, careful observation and research and rich experience are needed to determine the real cause of malfunctions. After determine the cause of malfunctions, eliminate them from the easy ones to hard ones.

Table 8-3 Common faults of electrical control system and measures

| Category              | Faults                               | Cause of faults                                                                                                                                                                                    | Measures                                                                                                             |
|-----------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Electricity component | Non-operation of Magnetic valve      | ①Broken circuit or short circuit<br>②Rust-eaten of magnet<br>③Spool abrasion or invalidation of seal-ring aging<br>④Severe oil carbon pollution in the valve<br>⑤Invalidation of deflection spring | ①Change loop<br>②Scrubbing magnet<br>③Change spool or seal ring<br>④Scrubbing magnet<br>⑤Change the spring           |
|                       | Air Ejection from Magnetic valve     | Invalidation of magnetic valve                                                                                                                                                                     | Change the magnetic valve                                                                                            |
|                       | Water level alarm as full water tank | ①Short circuit<br>②Fault of structure of water level switch<br>③Reverse of water level switch                                                                                                      | ①Check and recovery<br>②Change<br>③Full install, make sure that the switch close if there is water in the water tank |
|                       | No indication of fuel level          | ①Broken circuit<br>②Reverse of power line and signal line                                                                                                                                          | ①Check and recovery<br>②Check and correct                                                                            |
|                       | Inaccuracy of fuel oil level         | ①Line abrasion, there is contact resistance between signal line and power line<br>②Invalidation of sensor                                                                                          | ①Check and recovery<br>②Change                                                                                       |
|                       | Non-operation of Temperature switch  | ①Fault of circuit<br>②Switch damaged                                                                                                                                                               | ①Check and recovery<br>②Change                                                                                       |
|                       | Big error of temperature switch      | ①Inaccuracy of temperature switch adjusting valve<br>②Invalidation of temperature switch                                                                                                           | ①Readjust<br>②Change                                                                                                 |
|                       | Non-operation of pressure switch     | ①Fault of circuit<br>②Switch damaged                                                                                                                                                               | ①Change<br>②Check and recovery                                                                                       |
|                       |                                      |                                                                                                                                                                                                    |                                                                                                                      |

COMMON FAULTS AND MEASURES

Container Reach Stacker Maintenance Manual



| Category              | Faults                                                                                                                         | Cause of faults                                                                                                                                              | Measures                                                                                                                  |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Electricity component | Big error of movements of pressure switch                                                                                      | ①Adjusting valve of pressure switch inaccuracy<br>②Invalidation of pressure switch                                                                           | ①Reset<br>②Change                                                                                                         |
|                       | No signal of pressure sensor                                                                                                   | ①Broken circuit<br>②Reverse of power line and signal line                                                                                                    | ①Check and recovery<br>②Check and correct                                                                                 |
|                       | Big Error of pressure sensor                                                                                                   | ①Line abrasion, there is contact resistance between signal line and power line<br>②Invalidation of sensor                                                    | ①Check and recovery<br>②Change                                                                                            |
|                       | Wrong signal of accelerator pedal, start-up the engine, which reaches the max speed, when step on the pedal, the speed reduces | Reverse of pedal power wire and ground wire                                                                                                                  | Check and recovery                                                                                                        |
| Electricity component | Non-operation of wane switch                                                                                                   | ①Wane switch failed<br>②Lead wire is off                                                                                                                     | ①Change<br>②Check and recovery                                                                                            |
|                       | Indicator light failed                                                                                                         | ①Bulb broken<br>②Something wrong with electricity wire                                                                                                       | ①Change the bulb<br>②Find out the reason then deal with it                                                                |
|                       | Contactar armature cannot fall when electricity failure                                                                        | ①Too soft of contact spring<br>②Ragged and protrude bottom board<br>③Tightly seized of armature and mechanical parts<br>④Contacts are fusion welded together | ①Adjust the elastic force<br>②Remove of the protrude part<br>③Refit that to make it more flexible<br>④Change the contacts |
|                       | Contactar cannot fully close when power on                                                                                     | Too soft of contact spring                                                                                                                                   | Adjust the elastic force of the spring                                                                                    |
|                       | Contact of relay generates heat                                                                                                | ①Load exceeds the rated capacity<br>②Large range of contacts<br>③Severe burning loss of contact<br>④deficient pressure of contacts                           | ①Find out the reasons then deal with it<br>②Change the contacts<br>③Change the contacts<br>④Change the contacts           |
|                       |                                                                                                                                |                                                                                                                                                              |                                                                                                                           |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category                 | Faults                                                     | Cause of faults                                                                                                                                                                                  | Measures                                                                                                                                                                                                                                      |
|--------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electricity<br>component | Pool contact of relay                                      | ①There is dust、dirt or burnout<br>②Too soft of contact spring                                                                                                                                    | ①Find out the reason then deal with it<br>②Inspection on spring force, Change that if necessary                                                                                                                                               |
|                          | There is sparkle on the contact of relay when it is closed | ①Contact is not qualified<br>②Too soft of contact spring<br>③Burning loss of contact, poor contact                                                                                               | ①Change the contacts<br>②Change the spring<br>③Change                                                                                                                                                                                         |
|                          | Exception noise of direct current contactor                | ①Pool connection of armature and iron core<br>②Large pressure of contact pressure                                                                                                                | ①Clean out the joint surface<br>②Change the contact spring and contactors if necessary                                                                                                                                                        |
|                          | Cannot break away the accumulator switch                   | ①Contacts are welded together<br>②Tightly seized of mechanical structure                                                                                                                         | ①Change the contacts or switch<br>②Repair it to make it flexible                                                                                                                                                                              |
|                          | Non–operation of preheating heater                         | ①Circuit broken<br>②Heater damaged                                                                                                                                                               | ①Inspection and maintenance<br>②Change                                                                                                                                                                                                        |
|                          | Press down the set–up button, the wiper has no response    | ①Loose of conductor connector<br>②Burn–out of control circuit fuse<br>③No zero line in the control circuit, which cannot constitute control circuit<br>④Relay damaged<br>⑤Priming button failure | ①Retighten the connector<br>②Find out the reason then clear of that<br>③Re–connect the zero line<br>④Inspection on relay, change that as being conformed to be damaged<br>⑤Inspection on button ,change that as being conformed to be damaged |
|                          | The horn chirping ceaselessly when being electrified       | ①Short circuit of horn power wire and control power line<br>②Fusion welding of contact of horn controller                                                                                        | ①Check and recovery<br>②Change the relay                                                                                                                                                                                                      |
|                          | Acousto–optic alarm failure                                | ①Lead wire break off or circuit broken<br>②Warner damaged                                                                                                                                        | ①Inspection and recovery<br>②Change                                                                                                                                                                                                           |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category                 | Faults                                                                                           | Cause of faults                                                                                                                                                                                                     | Measures                                                                                                                                                                                                                              |
|--------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electricity<br>component | No response of screen when the system is electrified                                             | ①Circuit broken<br>②Burn–out of power fuse<br>③The fuse of enter point power is burn–out<br>④Input–output circuit failure<br>⑤Endless loop of program<br>⑥The controller is damaged                                 | ①Check and recovery<br>②Change the fuse<br>③Change the fuse<br>④Check and recovery<br>⑤Check and recovery, refresh the program<br>⑥Change the controller                                                                              |
|                          |                                                                                                  |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                       |
| Electricity<br>component | The engine cannot setup when rotate the key switch                                               | ①Loose of the lead wire contact<br>②Burn–out of fuse of control circuit<br>③Position handle not at neutral position<br>④Setup relay damaged<br>⑤Failure of setup key switch                                         | ①Retighten the contactors<br>②Find out the reason then deal with it<br>③Put the position handle to neutral position<br>④Inspect on the relay, change that after confirmation<br>⑤Check on the key switch and change that as confirmed |
|                          | Rotate the start–up key switch, no movement of start–up relay or start–up contractors            | ①Pool contact of startup key switch<br>②Burn–out of the body of control circuit fuse<br>③Pool contact of lead wire or contactors<br>④Loose of the lugs of relay or contactors or something wrong with the wire ring | ①Find out the reason then deal with it of that<br>②Change the fuse body after Inspection<br>③Find out the reason then deal with it of that<br>④Find out the reason then deal with it                                                  |
|                          | Engine speed cannot reach to the rated speed                                                     | ①Footplate locked, enable to step to the end<br>②Output signal of gun with mistake<br>③Connectors loose or drop                                                                                                     | ①Make the footplate elastic<br>②Ensure the output signal of gun1.6V~3.8V<br>③Check connector and wire                                                                                                                                 |
|                          | After starting the engine, and engaging a gear, the crane can not move with the lights lighting. | ①Braking system has some mal function, with a braking signal<br>②Still with signal as parking                                                                                                                       | ①Inspection and exclusion<br>②Open the parking button                                                                                                                                                                                 |
|                          | No indication of the whole car speed, and can only run at gear one                               | ①Earth connection of power line with problem<br>②Velocity sensor is damaged<br>③Breadboard is damaged                                                                                                               | ①Check and repair<br>②Change<br>③Change the gate, and change the frequency divider is necessary                                                                                                                                       |
|                          |                                                                                                  |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                       |
|                          |                                                                                                  |                                                                                                                                                                                                                     |                                                                                                                                                                                                                                       |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category              | Faults                                                            | Cause of faults                                                                                                                                                                                                                                         | Measures                                                                                                                                                |
|-----------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electricity component | Some of the one-to-four gears cannot be put up                    | ①Gear handle is not flexible<br>②Connectors loose or drop                                                                                                                                                                                               | ①Check and repair gear handle<br>②Check connector and wire                                                                                              |
|                       | Power supply being on, the main cut-out switch of duct pilot trip | Duct pilot is short, for example, conducting wire insulation is short to ground, electric coil is burnout, magnet coil is short, wire is wrongly jointed, etc                                                                                           | Find the causations and exclude them                                                                                                                    |
|                       | Something wrong with Air conditioner                              | ①The cut-out switch of its power supply trip<br>②The on-off of freezing pressure has some malfunction<br>③Loose or off connection of the lines on air conditioning control panel, condenser maybe has some malfunction                                  | ①Inspect the fault, and then close the cut-out switch after you confirm it<br>②Check and Change<br>③Inspection and recovery                             |
|                       | Hydraulic cooling system cannot refrigerate automatically         | ①The fuse of power supply is burned out<br>②Temperature switch is damaged<br>③Movement controlling relay contact is sweated<br>④Cooler electromagnetic valve maybe has some malfunction<br>⑤Radiator motor failure                                      | ①Change the fused body<br>②Change<br>③Change contacts<br>④Confirmed and recovery<br>⑤Confirmed and change                                               |
|                       | Only part movements of spreader                                   | ①Malfunction of lines, conducting wire is abraded<br>②Corresponding electromagnetic valve is locked<br>③The ring of magnetic valve damaged<br>④Spreader controller damaged<br>⑤The button of operating handle has some malfunction has some malfunction | ①Inspection and recovery<br>②Tidy the magnetic valve<br>③Change the ring<br>④Change<br>⑤Check and maintain it, change the button or handle if necessary |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category              | Faults                                                                                       | Cause of faults                                                                                                                                                                                                             | Measures                                                                                                                             |
|-----------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Electricity component | No movement of the spreader                                                                  | ①The power supply fuse of hanger control device is burned out<br>②The lines of general oil supplying valve have some malfunction<br>③General oil supplying valve maybe has some malfunction<br>④Spreader controller damaged | ①Change the fuse<br>②Inspection and recovery<br>③Check and resume it, change the general oil supplying valve if necessary<br>④Change |
|                       | The yellow indication light blinking or bright all the time as the spreader has not location | ①Induction distance of location sensor with problem<br>②Location sensor is damaged<br>③The yellow indication light is damaged                                                                                               | ①Adjust the distance of the four location sensor<br>②Change the sensor<br>③Change the yellow indication light                        |
|                       | The spreader has released but no red indication light or twinkling                           | ①Wrong induction distance of unlock sensor<br>②Location sensor is damaged                                                                                                                                                   | ①Adjust the two induction distance of unlock sensor<br>②Change the sensor                                                            |
|                       | The spreader has unlocked, but no red indication light or twinkling                          | Red indication light is damaged                                                                                                                                                                                             | Change the red indication light                                                                                                      |
|                       | The spreader has locked in, but no red indication light or twinkling                         | ①The induction distance of lock in sensor with problem<br>②Tighten sensor is damaged                                                                                                                                        | ①Adjust the two induction distance of tighten sensor<br>②Change the sensor                                                           |
|                       | The spreader has locked in, but no white indication light or twinkling                       | White indication light damaged                                                                                                                                                                                              | Change the white indication light                                                                                                    |
|                       | No operation of the boom                                                                     | ①Burn-out of power fuse of boom control<br>②Circuit failure, no handle signal input of the screen or with proportion valve output signal, circuit failure<br>③With or without safeguards                                    | ①Change the fusing body<br>②Change and recovery<br>③Check according to the safety protective table                                   |
|                       | The operation of the boom Lose of control                                                    | ①Big interfer signal<br>②Handle signal wire scored<br>③Handle damaged<br>④Electric proportional valve damaged                                                                                                               | ①Make the handle earth-touching reliable<br>②Repair the handle<br>③Change the handle<br>④Change the proportional valve               |

COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual



| Category                 | Faults                                         | Cause of faults                                                                                                                                                                                           | Measures                                                                                                                          |
|--------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Electricity<br>component | Nutation emergency is failed                   | ①Without key switch<br>②Magnetic valve of Nutation emergency failure<br>③Connectors loose or drop                                                                                                         | ①Turn on the key switch<br>②Overhaul the magnetic valve<br>③Check connector and wire                                              |
|                          | Inaccuracy of weight-measuring                 | ①Reverse plug of rod and rodless pressure sensor<br>②Pressure sensor damaged<br>③Connector lug loose of drop                                                                                              | ①Joint the wire correctly<br>②Change the pressure sensor<br>③Check connector and wire                                             |
|                          | ROPS give an alarm                             | ①Rough road surface<br>②Distance of Proximity switch improper<br>③Proximity switch damaged<br>④Connector lug loose of drop                                                                                | ①Smooth the road surface<br>②Adjust the distance of Proximity switch<br>③Change the Proximity switch<br>④Check connector and wire |
|                          | Abnormal show of the screen, figures distorted | ①Too much redundancy data<br>②The screen is disturbed by magnetism<br>③The screen damaged                                                                                                                 | ①Refresh the page<br>②Eliminate the interference source<br>③Change the screen                                                     |
|                          | the page data of the screen is abnormal        | ①Bus failure<br>②Bus terminal resistance damaged or lead fell off                                                                                                                                         | ①Check the wire and recovery<br>②Change the resistance and check the wire and recovery                                            |
|                          | No operation of controller                     | ①Power fuse burn out<br>②Power fuse burn-out on the enter point<br>③Power fuse burn-out on the enter point<br>④To judge the state of the program according to the instruction book<br>⑤Controller damaged | ①Change the fuse<br>②Change the fuse<br>③Check and recovery<br>④Check、 recovery and refresh the program<br>⑤Change the controller |
|                          | No operation of extended block                 | ①Power fuse burn-out<br>②No blinking of communication indication light<br>③There is light on the input、 output points but no operation                                                                    | ①Change the fuse<br>②Check and recovery communication wire<br>③Change the extended block                                          |
|                          | Cab can not move                               | ①No key switch<br>②Magnetic valve damaged<br>③Connector lug loose or drop                                                                                                                                 | ①Check the switch<br>②Check and repair magnetic valve<br>③Check connector and wire                                                |



COMMON FAULTS AND MEASURES  
Container Reach Stacker Maintenance Manual

| Category               | Faults                                               | Cause of faults                                                                                                                        | Measures                                                                                                                                                                             |
|------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Communi<br>cation wire | Communication fault of the engine and the controller | The engine works but no speed information on the screen                                                                                | Check whether the wire broken or with water                                                                                                                                          |
|                        | Controller and I/O extended block                    | There is length and angle indication on the screen but without gear information, and the red light of the I/O extended block always on | Check whether the wire broken or with water                                                                                                                                          |
|                        | Controller and screen                                | The screen is ok but no content on it                                                                                                  | ①Check whether the wire is broken or water intake;<br>②Check whether terminal resistance burn out or bad connects, The terminal resistance locates on its plugs.                     |
|                        | Controller and length and angle sensor               | The indication of the length and angle of the boom is abnormal the others are ok                                                       | ①Check whether the wire is broken or water intake;<br>②Check whether terminal resistance burn out or bad connect .As the terminal resistance locates in the length angle sensor ,the |

9.Maintenance of Equipment Tracking Sheet

Maintenance of equipment tracking sheet 1

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 2

| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 3

|                      |                  |           |                 |                    |                  |                  |          |            |               |  |  |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|----------|------------|---------------|--|--|
| Equipment Name       |                  |           | Manufacture No. |                    |                  | Using Start Date |          |            | Working Place |  |  |
| Maintenance Contents |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator | Using time |               |  |  |
| 1                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 2                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 3                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 4                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 5                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 6                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 7                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 8                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 9                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 10                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 11                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 12                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 13                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 14                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 15                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 16                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 17                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 18                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |

Maintenance of equipment tracking sheet 4

|                      |                  |           |                 |                    |                  |                  |          |            |               |  |  |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|----------|------------|---------------|--|--|
| Equipment Name       |                  |           | Manufacture No. |                    |                  | Using Start Date |          |            | Working Place |  |  |
| Maintenance Contents |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator | Using time |               |  |  |
| 1                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 2                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 3                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 4                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 5                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 6                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 7                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 8                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 9                    |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 10                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 11                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 12                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 13                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 14                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 15                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 16                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 17                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |
| 18                   |                  |           |                 |                    |                  |                  |          |            |               |  |  |

Maintenance of equipment tracking sheet 5

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 6

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 7

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 8

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 9

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 10

|                      |                  |           |                 |                    |                  |                  |               |            |
|----------------------|------------------|-----------|-----------------|--------------------|------------------|------------------|---------------|------------|
| Equipment Name       |                  |           | Manufacture No. |                    | Using Start Date |                  | Working Place |            |
| Maintenance Contents |                  |           |                 |                    |                  |                  |               |            |
| No.                  | Maintenance Part | Materials | Materials type  | Materials quantity | Materials Source | Maintenance date | Operator      | Using time |
| 1                    |                  |           |                 |                    |                  |                  |               |            |
| 2                    |                  |           |                 |                    |                  |                  |               |            |
| 3                    |                  |           |                 |                    |                  |                  |               |            |
| 4                    |                  |           |                 |                    |                  |                  |               |            |
| 5                    |                  |           |                 |                    |                  |                  |               |            |
| 6                    |                  |           |                 |                    |                  |                  |               |            |
| 7                    |                  |           |                 |                    |                  |                  |               |            |
| 8                    |                  |           |                 |                    |                  |                  |               |            |
| 9                    |                  |           |                 |                    |                  |                  |               |            |
| 10                   |                  |           |                 |                    |                  |                  |               |            |
| 11                   |                  |           |                 |                    |                  |                  |               |            |
| 12                   |                  |           |                 |                    |                  |                  |               |            |
| 13                   |                  |           |                 |                    |                  |                  |               |            |
| 14                   |                  |           |                 |                    |                  |                  |               |            |
| 15                   |                  |           |                 |                    |                  |                  |               |            |
| 16                   |                  |           |                 |                    |                  |                  |               |            |
| 17                   |                  |           |                 |                    |                  |                  |               |            |
| 18                   |                  |           |                 |                    |                  |                  |               |            |

Maintenance of equipment tracking sheet 11

|                      |                  |                 |                |                    |                  |                  |          |            |
|----------------------|------------------|-----------------|----------------|--------------------|------------------|------------------|----------|------------|
| Equipment Name       |                  | Manufacture No. |                | Using Start Date   |                  | Working Place    |          |            |
| Maintenance Contents |                  |                 |                |                    |                  |                  |          |            |
| No.                  | Maintenance Part | Materials       | Materials type | Materials quantity | Materials Source | Maintenance date | Operator | Using time |
| 1                    |                  |                 |                |                    |                  |                  |          |            |
| 2                    |                  |                 |                |                    |                  |                  |          |            |
| 3                    |                  |                 |                |                    |                  |                  |          |            |
| 4                    |                  |                 |                |                    |                  |                  |          |            |
| 5                    |                  |                 |                |                    |                  |                  |          |            |
| 6                    |                  |                 |                |                    |                  |                  |          |            |
| 7                    |                  |                 |                |                    |                  |                  |          |            |
| 8                    |                  |                 |                |                    |                  |                  |          |            |
| 9                    |                  |                 |                |                    |                  |                  |          |            |
| 10                   |                  |                 |                |                    |                  |                  |          |            |
| 11                   |                  |                 |                |                    |                  |                  |          |            |
| 12                   |                  |                 |                |                    |                  |                  |          |            |
| 13                   |                  |                 |                |                    |                  |                  |          |            |
| 14                   |                  |                 |                |                    |                  |                  |          |            |
| 15                   |                  |                 |                |                    |                  |                  |          |            |
| 16                   |                  |                 |                |                    |                  |                  |          |            |
| 17                   |                  |                 |                |                    |                  |                  |          |            |
| 18                   |                  |                 |                |                    |                  |                  |          |            |